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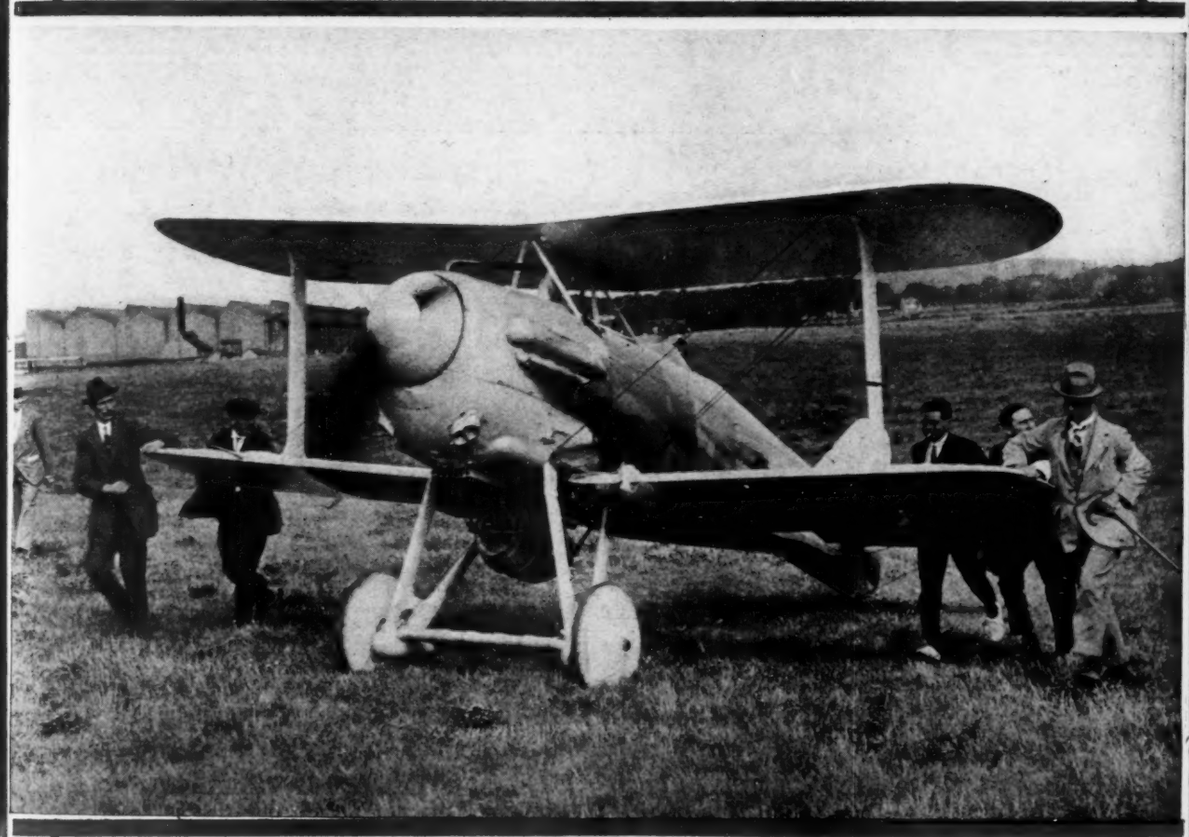

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VOLUME XV

NUMBER 9

SPECIAL FEATURES

DESCRIPTION OF HANNOVER GLIDER "VAMPYRE"

LINCOLN-STANDARD LS5 COMMERCIAL AIRPLANE

THE INTERNATIONAL AIR CONGRESS, LONDON, 1923

THE CURTISS RIB TESTING MACHINE

THE GARDNER, MOFFAT CO., INC.

HIGHLAND, N. Y.

225 FOURTH AVENUE, NEW YORK

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AUGUST 27, 1923

AVIATION

VOL. XV. NO. 9

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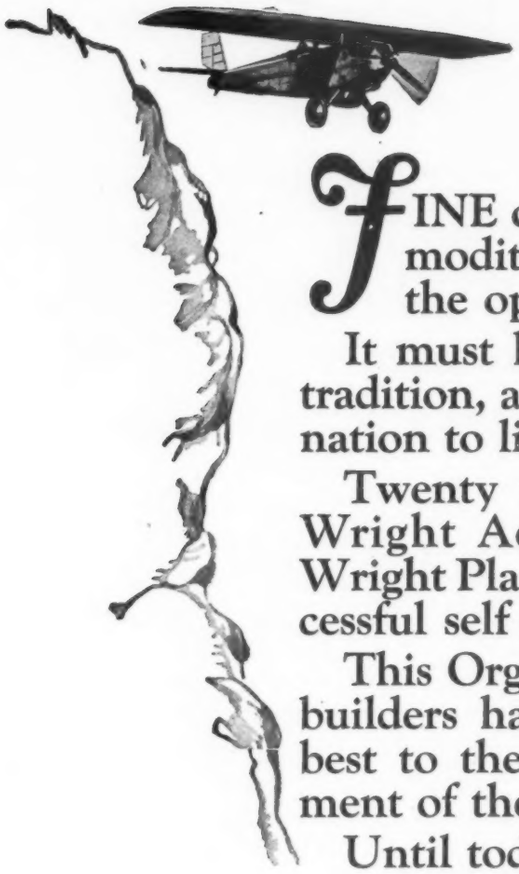

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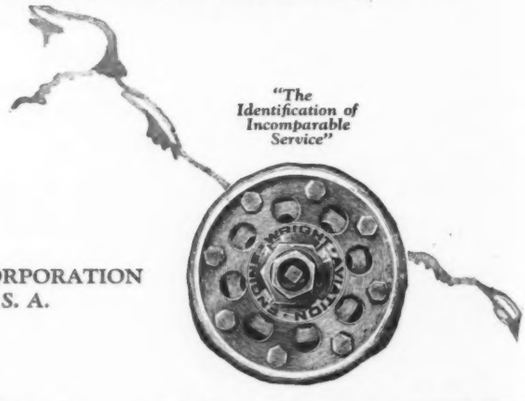

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Vol. XV | August 27, 1923 | No. 9

An International Air Conference

THE American Legion is proposing to President Coolidge that he call an international conference of all nations to discuss the limitation of aerial armament.

AVIATION has expressed its views on such a possible conference several times but a restatement at this time may be helpful to those uninformed but well intentioned persons who are trying to prevent our development of an air defense.

Air forces, being new, are naturally considered to be a means of warfare that can be stopped at the start by eliminating from the budgets of all countries the great cost of competitive construction of huge air fleets, through some form of international agreement. The precedent set by the Washington Conference in limiting naval expansion is seized upon as a method of curbing air power before it gets under way.

Several classes of persons are thinking along these lines. The pacifist group that is against all war preparation is the most logical. It does not single out any particular form of warfare but is opposed to all war equipment. Those idealistic and hopeful proponents of an overseeing international parliament are also apt to use the spectacular elements of air and gas warfare to illustrate the horrors of modern combat in their efforts to rally to their support the popular mind.

The old line naval and military officers who have a proverbial distaste for new forms of combat weapons have done all in their power to prevent the growth or even the utilization of aerial equipment. They have a very real fear that the economy and efficiency of an air force may have a limiting effect on their particular specialities with resulting cuts in appropriation.

And now the American Legion for reasons not yet clear is taking an active part in this direction.

That such a conference will not be called by this country is as certain as any prediction can be made. The reason for this assertion is to be found in the present status of the aerial forces of the world. France dominates Europe in the air. Great Britain is planning to make her air force equal France's strength in the air. Italy, Russia and Japan are strengthening their air forces to an extent that is not generally known in this country. All other countries are studying the problem of aerial defense and beginning to build up air forces.

The United States, where the airplane was born, has been backward in the development of this arm chiefly on account of opposition of the older services. Since the war, the development has been more in the nature of studying types than in preparation for any war emergency. We have proved beyond question that American aeronautical engineers lead the world in the design of military and naval aircraft. This is shown by the records which we now hold. Our pilots, too, have no peers in any service. But our strength ends there. Quality we have but quantity we are without.

It, therefore, must be evident that the United States is in no position to call such a conference and have the precedent of the limitation of naval armament used to make us permanently a third rate power in the air. But the controlling reasons will not be wholly international. They will be influenced by the growing conviction that air power is the least expensive of all national safeguards. When this is permitted to be demonstrated, it will then be possible to determine whether the next conference on limitation of armaments should be based on economy or newness.

The Night Mail a Success

THE feeling of confidence in the certainty of the air mail's night flying tests succeeding, expressed by everyone familiar with the experiment did not even temper the enthusiastic outburst of praise that has come from coast to coast. No single achievement in aviation since the beginning of the air mail is filled with the promise of immediate usefulness as the practical demonstration of a twenty-eight hour schedule across the continent.

Continuous day and night flight is here and awaiting the necessary funds to start it as a permanent part of our commercial intercommunication routine. Postmaster General New is doing all in his power to bring the Air Mail up to its maximum usefulness. Col. Paul Henderson and his capable staff have shown their skill in organizing the trials. The pilots, as always, have done their part with the greatest enthusiasm and success. The next group to do its part is Congress. It will determine whether or not the expediting of mails by air mail is to go on to new achievements or remain as a record. Notwithstanding the general tendency to curtail appropriations, here is a service where even the most tight fisted congressman will realize that money invested in air mail will bring great direct returns as well as a service that will be utilized by every business interest and individual along the route.

It is to be hoped that the railroads will not in any selfish spirit oppose this development. The railroads have rendered water transportation almost a lost art on the smaller rivers and the canals are relics of a picturesque era. Aircraft may have in the future some effect on railroad earnings but they will be so insignificant when compared to the great advantages that it will more likely lead the railroads to operate their own fast air routes. Already some of the leading railroad companies are investigating this possibility. Then, the Post Office Department will gladly turn this business over to private operators.

Description of the Hannover Glider "Vampyre"

Considerations which Led to its Construction and Results Obtained from Extensive Tests

By WALTER BLUME

Much serious thought is given at the present time in various sections of the country to the allied problems of motorless flight and glider construction. It is being realized to an ever increasing extent that gliding flights afford an unequalled and inexpensive means for full scale experiments of aerodynamic structures, such as aerofoils, fuselages and tail surfaces, taken singly or in combination with one another. That such experiments will eventually lead to a much greater economy in power flight is already indicated by the remarkable performances of some so-called "light planes", or low powered airplanes.

The impulse to this revival of gliding experiments, which lay dormant for some ten years, was furnished by the German gliding meets held in the Rhoen hills from 1920 on. During the 1921 meet the best performance was a 15 min. flight; the following year gliding flights of one, two and three hours' duration were made on the machine which forms the subject of this article.

The author of this article is a graduate of the Hannover Institute of Technology. During the late war he was one of Germany's outstanding army fliers and a commanding officer of a pursuit squadron on the Western front. As furthermore Mr. Blume piloted one of the "Vampyre" gliders in the 1921 Rhoen meet, he is particularly well qualified to express an opinion on this type of machine from the technical as well as from the operational viewpoints.—EDITOR.

After the treaty of Versailles German aircraft building was deadlocked. The stipulations of this treaty forbade the construction of aircraft material. All but about 150 airplanes and almost all engines and aircraft supplies were destroyed by the Interallied Commission. This prohibition ruined the aircraft industry. It took much time until the production was changed, and many plants had to close their doors.

However, though the destruction of the material did us great damage, it helped a little bit in one way; we could forget the inefficient relics of war time, especially engines and spare parts. The designer was free to make complete use of recent experience, to devise radical improvements, which should make civil aviation commercially efficient.

Improving Performance

It had been recognized early, in Germany, that the usual way of increasing the performance, by more engine power, was too expensive for commercial flying. This idea was propagated especially by Oscar Ursinus, editor of the magazine Flugsport. He advocated in this line of thought reduced engine power and increased aerodynamical efficiency. He intended to create a low-powered airplane with the performance of the present fuel wasters. The first step should be the air flivver, with a motorcycle engine only, but of such performance as to permit commercial use.

It was also desirable to study the development of the wings, etc., independently from the engine. This could be done by constructing and flying motorless gliders. Before the war, students from Darmstadt had already practiced gliding on the slopes of Mount Wasserkuppe, the highest summit of the Rhoen hills. Ursinus organized a glider meet and held it at that place. The first meeting, in 1920, brought nice flights. While Orville Wright's duration record of 9 min. 45 sec. was not beaten, the meeting raised interest in wide circles, and the construction of gliders was started at many places.

At the Hannover Institute of Technology a Department of Aeronautical Research had been founded during the war from donations of the Hannover Wagon Co. (Hawa). In 1921 the chief of the department, Dr. Arthur Proell, professor at the Institute, resolved to cooperate in the new movement and to develop a sailplane. This plan was readily supported by Hermann Dorner, the Chief Engineer of the Hawa, and by M. Nusa, the President and General Manager of the Company.

The design of the sailplane was assigned to Dr. Georg H. Madelung, well known for his work with the *Flugzeugmeisterei* (German Bureau of Aeronautics). It is Mr. Madelung's special merit that he was the first to emphasize the importance of the rate of descent for soaring flight. He insisted to give this factor the first consideration. By application of regular analysis and of all available aerodynamic and structural experience, Mr. Madelung succeeded in creating a new type of sailplane, which realized the intended properties to a high degree.

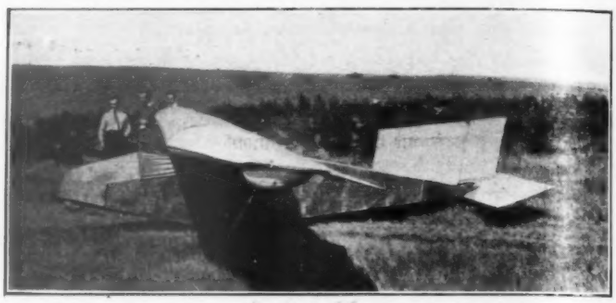


Fig. 1. The Hannover glider "Vampyre" at the 1922 Rhoen gliding competition

Main Features of Design

Under his directions, the sailplane was designed by the author, with the cooperation of two fellow students. With Friedrich H. Hentzen, he worked out the wing and the static tests, while Arthur Martens drew the body and the control surfaces. Professor Proell helped with experience and suggestion, and so did Mr. Dorner, who, by the way, is one of the oldest pilots and designers in Germany. For the construction, the Hawa gave the conveniences of their shops and the help of a few skilled old workmen. Model tests were run at Goettingen, with usual accuracy. A very valuable help was that of the Continental Rubber Company of Hannover, who took care of the making of special landing wheels.

Leading Ideas—The leading ideas of the design were:

1. Aerodynamically—A low rate of descent, and a good gliding angle. This was obtained by a very high aspect ratio of the wing; by a selection of very low section drag/lift ratio, good at high lift especially, and sufficiently thick for internal bracing; by reduction of parasitic drag, and by a special arrangement of the body, by which a bad reaction on the wing is carefully avoided.

2. Structurally—Rigidity, and resistance to very different load conditions; crashproofness.

3. For manufacturing—Simplicity in detail and assembly.

4. For service—Rapid division into handy parts; foolproofness.

Wing—To obtain a very high aspect ratio, the wing was given the greatest span that we hoped to be able to handle,

41.3 ft., with a chord of 4 ft. 9 in. only, tapering to 2 ft. 6 in. at the tip. That span is very unusual for an airplane of 174 sq. ft. only, and for transport and stowing it was necessary to subdivide it into three parts; a non-tapered center wing, of uniform thick section, and two tapered outer wings, ending in a thin section at the wing tip.

Beam—The structure of the wing is quite unconventional. In spite of the abnormally large span, the wing is internally

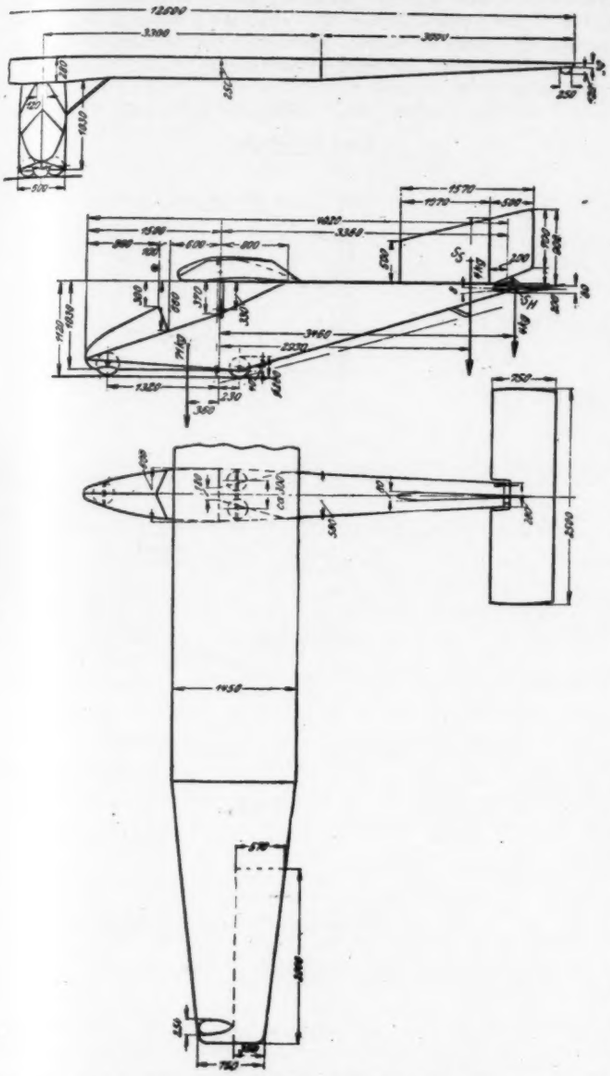


Fig. 2. Outline drawings of the Hannover glider "Vampyre" (Dimensions in millimeters)

braced only, and, instead of the conventional two beams, it has but a single beam, and torque supporting nose cover. The beam itself is more ordinary: an I-beam with pine flanges and a plywood web, with stiffening strips and triangular lightening holes, in the form of a Pratt truss. It was designed to stand two different conditions: a uniformly distributed lift, with a factor of safety of five, to conform with the case of rough flying; or a load equal to the full weight of the ship, applied to a wing tip, which represents the case of hitting the ground with the wing tip. This latter case seemed necessary, considering the large wingspan and the small tread of the landing wheels.

Torque Tube—The single beam is, of course, unable to carry the torque moments, which tend to twist the wing at high speed, especially in a dive. For this reason, the nose part of the wing is covered with plywood. Together with the web of the beam, this cover forms a rigid tube, able to carry the torque moment. It was designed to carry the most unfavorable condition, with the limit speed obtained from a long dive, and with a factor of safety of 2.5. We checked the safety, both against bending and torque, by a static test on a wing element, before we started the final construction. This plywood tube also makes the nose part very rigid and smooth.

Ribs—It seemed worth while to pay much care to the development of a good rib, and, as it is hardly possible to determine the strength of a rib by regular stress analysis, static tests were extensively used. A standard rib had to carry 90 lb., in the worst case, and we continued lightening and reinforcing until a very light rib resulted and stood the load. The main ribs are 20 in. apart. One or more secondary ribs stiffen the nose part,, and extend partly beyond the beam. The rear part of the wing is covered with a light grade cotton, and doped.

Assembly—In a light sailplane the center of gravity shifts considerably when a heavy pilot is replaced by a light one. We took care of this by an adjustment of the wing; it can be moved forward or backward 8 in. A special connection was required by the form of the body. It is very narrow below the beam, not broader than the pilot's head, but it has the full width near the trailing edge. The joint is, therefore, a three point connection. In the front, one center-fitting connects the wing beam to the main bulkhead of the body, with a longitudinal connecting bolt, and, in the rear, two fittings with transversal bolts connect the trailing edge to the two upper longerons and to a rear body bulkhead. The nose part of the wing is entirely unsupported. The torque of the torque tube is carried back to the two rear fittings by two rib-shaped bulkheads, covered with plywood for lateral stiffness. This is well visible on photo No. 1. This connection would have been sufficient; however, we had not much experience about lateral and wing tip landings, and, to be on the safe side, we made a lateral bracing by struts between the beam and the main bulkhead.

Wing Joint—A special problem was the detachable joint between the center wing and the two outer wings, which was necessary for stowing and railroad transport, and which was desirable also to reduce the cost of wing tip smashes. This joint carries the bending moments, especially those from a wing tip landing, and the torque moment in a dive. The bending stresses are carried from the pine flange into the metal fittings by a great number of copper rivets. The shear stresses in the plywood tube are taken by a special reinforced end rib and concentrated into three points: a fitting at the nose and the two fittings at the upper and lower flange. Very much attention was paid to the reliability of this joint. We made a careful stress analysis and tested the elements which compose the joint.

Fuselage Construction

Fuselage—The fuselage is of peculiar shape, and is the result of aerodynamical and service considerations. At the very low speed of soaring, the proper drag of the body is almost negligible, but its reaction on the wing can become very bad. Former experiments had shown that an arrangement of the fuselage below the wing affects the performance the least. This arrangement was therefore chosen. With this primary consideration, the details of the shape resulted from the absence of a landing gear, from the different angles of incidence required for starting and landing, and from the desire for visibility.

The surroundings of the pilot were developed for crash-proofness: laminated ash longerons, forming a continuous bow in the front, ash keel, ash spine, and ash bulkheads, completely covered with heavy 3/32 in. birch plywood; a quite "monolithic" structure of the kind which has behaved so well in many crashes of war-time and earlier. Behind the great main bulkhead the body is square, ending in an horizontal edge. Here the sides are covered with light 0.05 in. alder plywood, and top and bottom with doped cotton.

Tail Surfaces—No stabilizer was used. A balanced elevator alone is so much simpler, and the stabilizer forces are not so large (260 lb. maximum) that they could not be handled easily. Also, it seemed desirable that the sailplane should respond to the controls immediately, to make use of gusts eventually. The elevator has one arm only, on the upper side, controlled by a connecting rod. The lower side, which is rather near the ground in lanćing, is clear.

Fin and rudder appear to be relatively large. It was, however, observed in the wind tunnel that even with fixed rudder the excess of directional stability is only small.

Landing Gear—Neither sliding skids nor ordinary wheels were used. Skids have too much friction; they require too much pull for starting, and cause the plane to capsize in landing. Also, they rut too much, and are therefore dangerous in side landings. Ordinary wheels sink too deep into the soft mossy ground which prevails at the Wasserkuppe, and would not stand side landings either.

That high landing gears had to be avoided is obvious. Those who did not, smashed them almost without exception.* With the absence of a propeller, there was not, really, a necessity to put the body on stilts.

which was very high in the wind tunnel test. In the Rhoen, with no wind, or 7 to 10 m.p.h. only, the glider started easily after from 50 to 70 ft. run, pulled by from four to six men. It must be considered here that it was heavier than any of the other gliders. Other gliders, of high wing loading, were not able to leave the ground at all, and the gliders which showed comparable performances had about one-half the dead weight and correspondingly less strength.

Stability—The stability in flight checked with the results of the wind tunnel tests. Laterally, the sailplane was very steady, especially in curves, and agreeable to control. Even in very bad gusts the wing was absolutely controllable, in spite of its large span.

The elevator worked well. With the high ratio of move-

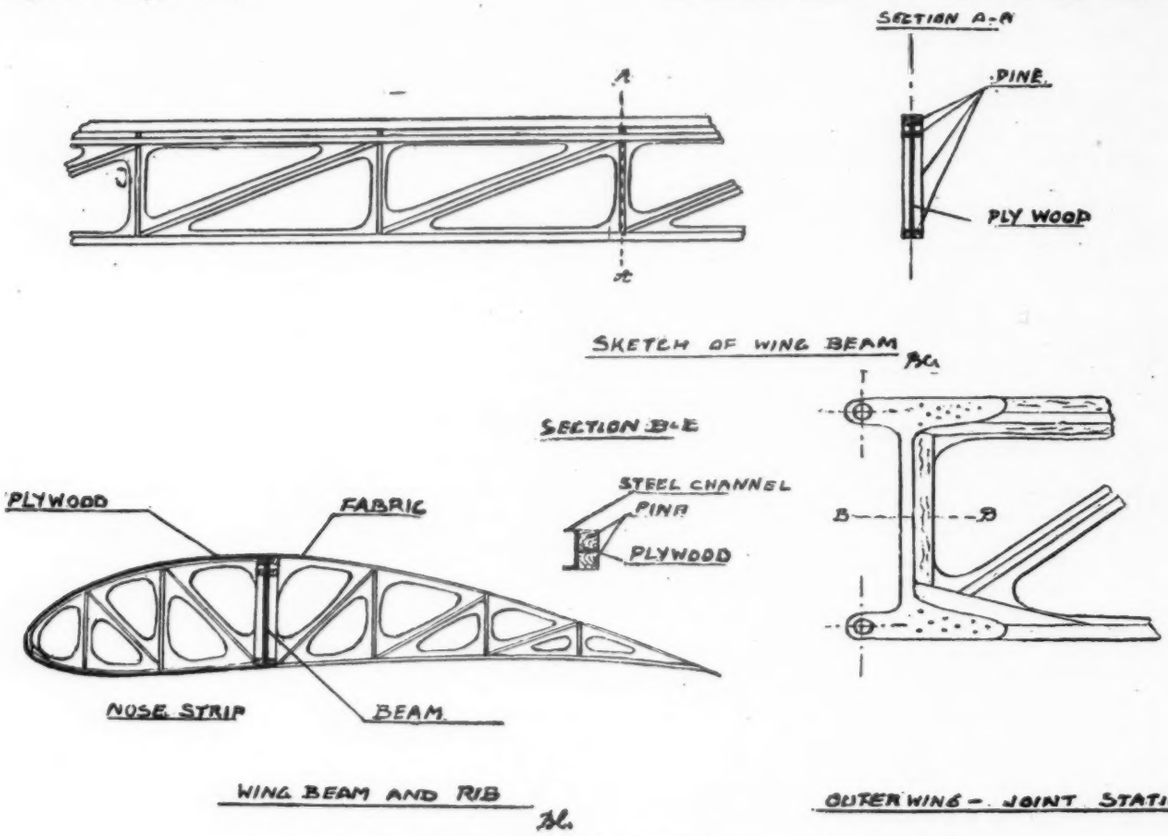


Fig. 3. Some constructional details of the Hannover glider "Vampyre"

Hermann Dorner's suggestion, the "football wheel", was a good solution for the problem; a ball-shaped leather casing with a rubber inner tube. The inner tube rides on the hub tube, and the casing is riveted to metal flanges. The axle is submerged in the body, only four inches of the balls sticking out. Due to their spherical form, they sideslip easily, without too much lateral resistance. One of these spokeless and rimless wheels is in the nose of the body, and two more are close behind the center of gravity.

Experiences from 1921 Flights

The ideas of the designers were put under trial during the 1921 Rhoen meeting and afterwards, in September and October. The crashproofness was well demonstrated in a bad crash, due to a faulty start, in which a wing tip hit the ground first and then the nose sideways. The ease of assembly and dissembly facilitated transport and repair. The new landing gear worked under most difficult conditions.

The aerodynamical properties were absolutely satisfactory. The gliding angle was almost the same as that of the model, and the rate of descent appeared to correspond exactly to its calculated value. The same applies to the maximum lift, ment that we used, it was very delicate, that is, immediately effective. A lower, less sensitive ratio would have made flying easier, but we desired immediate effectiveness to make the best use of gusts.

It is, of course, impossible then to avoid "over-controlling", but that is not necessarily dangerous. It will not provoke involuntary nose dives and spins unless the lift drops suddenly near the angle of incidence of maximum lift. The model tests of the center section and the wing tip section did not show this peculiarity, however; also, the wing tips have a lower (absolute) angle of incidence than the center wing. The theory was proven by the flights. When stalled, the glider did neither sideslip nor spin, but sank slowly on even keel.

The condition of stalling deserves careful consideration in the design of gliders. Stalling is very frequent in soaring flight. Pupils do it constantly. It happens even to experts in gusty weather, when a gust suddenly vanishes, and the pilot's attention is so easily distracted by other events.

Strength—Dives occur often, too, more or less involuntarily, frequently even at low altitude. It is a requirement of first order that the gliders be able to be righted immediately. It would be wrong to sacrifice strength of wing or control surfaces in order to gain a few pounds of weight. We designed the wing with a factor of safety of 5 for low speed condition,

*Klemperer's Aachen glider had flexibly suspended skids, which worked satisfactorily.

and both wings and controls for a factor of safety of 2.5 for the worst possible diving conditions. In service, consequently, we have not met any trouble. Speeds up to 56 m.p.h. did not do any harm, and from steep dives the glider could be righted easily.

The following tabulation shows the flights accomplished by the "Vampyre" during and after the 1921 meeting. Flight No. 4 brought us the first rewards. No. 5 added 50 per cent to Orville Wright's record of duration, and furnished a record of distance. No. 10 showed for the first time the typical soaring in circles and figure eights, above the western slopes of the Wasserkuppe, the sailplane remaining for four minutes above the starting point. This flight was the forerunner of the long 1922 flights.

SOARING FLIGHTS WITH THE "VAMPYRE" IN 1921

No.	Date	Duration Sec.	Distance Meters*	Drop of Altitude Meters	Aver. Rate of Descent in Cm.	Wind-Speed Meters /Sec.	Pilot
1	Aug. 23	108	1900	220	228	5-6	Martens
2	" 24	34	255	30.4	89.4	3-4	"
3	" 24	34	290	30.4	89.4	3-4	"
4†	" 25	333	3580	344.3	103	0-3	"
5‡	Sept. 5	940	7500	400	42.6	4-6	"
6	" 8	33	260	30	91	4-6	Blume
7	" 8	35	280	30.4	87	4-6	Martens
8	" 8	43	300	30	69.8	4-6	Blume
9	" 9	340	2300	200	58.9	7	"
10§	" 16	630	2000	325	51.6	5-6	"
11	" 17	275	1900	320	116.2	4-5	Martens
12	Oct. 8	600	5400	445	74.2	5-6	Blume
13	" 11	120	1000	100	83.5	0-3	Martens
14	" 11	745	5000	485	65	5-7	Blume

*The distance is airline from starting to landing place, curves neglected.
†During this flight two full circles were made.
‡During this flight two world's records for duration and distance in motorless flight were made.
§During this flight three figure eights and two full circles were made.

The Improved "Vampyre"

Though the "Vampyre" had met our expectations, we used the winter to refine a few details. It ought to be mentioned that it had been constructed within six weeks only, and had been completed after most of the meeting had passed. The first flight took place on the second last day of the meeting.

An idea which had not been worked out before the meeting was a flexible flap instead of the hinged aileron. By a systematic sereis of careful experiments, a mechanism was developed which would deflect the trailing end near the wing tip, from inside. All cables and levers are inside the wing. The control is by the usual stick, and is as easy as with the hinged ailerons.

The main advantage of this device is that it avoids the slot and the sharp edge along the hinge. In every position this flap follows a smooth curve. In consideration of the large percentage of the total drag which the section drag forms in a good glider, it is easily understandable how important this change was for the performance.

The following list shows the flights which were performed during the 1922 Rhoen meeting.

SOARING FLIGHTS WITH THE "VAMPYRE" DURING THE RHOEN COMPETITION IN 1922

No.	Date	Duration Min.-Sec.	Distance Meters	Rate of Descent M./Sec.	Wind-Speed M./Sec.	Pilot
1	Aug. 14	1'-44"	920	....		Hentzen
2	" 14	1'-0"	...	....		Martens
3	" 16	1'-41"	990	0.82	3-5	Hentzen
4	" 16	1'-48.5"	6,900	0.34	3-5	"
5	" 17	8'-49"	844	0.13	8-12	"
6	" 17	3'-29"	1,520	0.56	8-12	"
7	" 17	4'-41"	1,500	0.39	8-12	Martens
8	" 18	1'-43"	...	1.02	6-8	"
9	" 18	1 hr.-6'-0"	9,500	....	6-8	"
10	Aug. 19	2 hr.-0'-10"	10,000	....	8-11	Hentzen
11	Aug. 21	...	...	....	....	Martens
12	" 22	17'-0"	5,400	0.38	6-7	"
13	" 24	3 hr.-10'-0"	4,700	....	10-12	Hentzen

We feel that the Rhoen meetings have brought an advance to aeronautical science. The "Vampyre" represents the beginning of a standard type. Of course, the ultimate type, in years to come, will show better performance and will, in detail, have more or less different shape. New ideas will be incorporated, which partly we do not yet even divine. However, we were amply satisfied with the number of problems which arose from our departures from conventional practice. We went just so far that we could see the dangers and the progress.

French Seaplane Contest

The national seaplane competition organized by the French air department for Sept. 1, next, will consist of two distinct events: first, there will be what is termed a "race-cruise" from Saint Raphaël to Bizerte, Tunis, with an obligatory landing at Ajaccio, Corsica, and return to Berre, near Marseilles. The two legs of this route have a length of 756 and 866 km., respectively. Prior to this race there will be navigability and static tests. The carters and cylinders of the engines will be sealed and the wings and hull of the machines will be suitably marked to prevent substitution during the race. Only the wing floats are excepted from this rule. The competing machines will be placed according to the formula $\frac{PV}{W}$, where P is the weight in kilograms, V is the speed in km./hr., and W is the total horsepower. The value of the "weight" P is obtained from the formula $P = Q - \frac{(150 + W - 300)}{4}$, where Q is the useful load carried, minus fuel, oil, water and instruments, but including a crew of two men, a grapnel, sea anchor, towing and hoisting gear, emergency rations, Very pistol, a white light, and radio apparatus. This load must not be less than 225 kg. The speed V will be counted on the basis of the time elapsed between take-off and landing, and the total horsepower W will be counted according to the rating of the *Service Technique*.

The winner will receive a prize of F. 100,000, the second placed a prize of F. 30,000, and the third placed a prize of F. 10,000.

The second event of the competition will be a regularity contest under the rules of the Ministry of Marine, in which points will be given for special features, such a speed and ceiling for given loads, maneuverability. The machines competing in this event must answer certain type requirements, the following being admitted: high seaplanes and three-seater bombing seaplanes, which must be of the flying boat type; three-seater torpedo planes and two-seater ship board planes.

Planes of the high seas, bombing and torpedo types, in order to be placed, must cover either one of the two legs of the "cruise race" across the Mediterranean Sea in a non-stop flight.

The constructors of the types winning in each class will be rewarded by the government placing with each an order of F. 1,500,000, which amount does not include the price of the power plant.

Ten entries have been received for this competition, as follows: two twin-engined flying boats each from Lioré & Olivier (type H13), Bellanger-Dennaut and CAMS; two flying boats from Schreck (F.B.A.), and one each from Blériot and from Blanchard.

New Belgian Light Plane

An interesting light plane of Belgian manufacture, the Poncelet, has just been flight tested near Brussels by Lieut. V. Simonet, of the Belgian air service. The Poncelet light plane is a high wing cantilever monoplane fitted with a 10 hp. Anzani engine. The weight of the machine empty, but with 10 liters of gasoline and 2 liters of oil, is 160 kg. The wing loading, under full load, is 11 kg./sq.m., and the power loading 22 kg./hp. Maximum speed is 80 km./hr., cruising speed 70 km./hr., minimum flying speed 40-45 km./hr., and landing speed 35 km./hr. In the flying trials the machine climbed 1100 m. in 35 min. without any difficulty.

It may be added that this little ship has extremely pleasing lines, being probably the prettiest light plane yet built.

Encouraging Records

The French air department offers two prizes of F. 50,000 each to the French manufacturer who will beat before Jan. 1, 1924, the world's maximum speed and duration records now held by American pilots.

Lincoln-Standard LS5 Commercial Airplane

Production Begun on New Five-Place Semi-Enclosed Passenger Carrying Machine

The Lincoln-Standard LS5 was designed by O. W. Timm, Chief Engineer for the Lincoln-Standard Aircraft Corp. of Lincoln, Neb. to meet the demand for a practical five-place commercial and passenger carrying airplane. The tests have proven very satisfactory and production has been started on this model.

Safety and comfort for the passengers were the first considerations. Among the other principal points that were carefully considered are the safety factor, durability of the plane, economy of operation, repair and replacement of parts, minimum work in upkeep, etc.

Haskelite walls and plywood bulkheads from the pilot's cockpit to the nose. Struts and wires with doped fabric covering being used from the pilot's cockpit to the tail.

The interior wood parts are covered with several coats of Valspar varnish. The exterior is finished in dark maroon and Valspared. The motor compartment is painted with a gray fire resisting paint.

The motor is covered with an automobile type polished aluminum hood hinged at the top and sides and held in place with six spring fasteners.

The tail skid is mounted on a swivel post and secured with

Fig. 1. General view of the new Lincoln-Standard type LS5 commercial five-seater plane (180 hp. Hispano-Suiza engine)

Fuselage. The fuselage is of general rectangular cross section, the maximum depth being 52 in., and the maximum width being 33¾ in. The passenger compartment is 57 in. in length and is richly upholstered with maroon colored leather and seats four passengers with comfort. The passengers are protected from the wind by the partially enclosed portion of the cockpit. The enclosed portion is constructed of plywood and is provided with windows. Three steps lead to the passenger cockpit.

The longerons are of ash, braced with 3/32 in. three ply

⅜in. elastic cord to absorb the shocks. The skid is of hickory provided with a spring steel shoe.

Wings. The wings are constructed in conventional truss form. The overhang is braced with steel tubing streamlined with Balsa wood. The upper wing is made in two main panels and one center section. The lower wing is in two panels. The center section is built up of two main spars and plywood covering and contains a 42 gal. gasoline tank which is provided with a positive sight gage.

The wing spars are spruce routed to I-beam sections. The

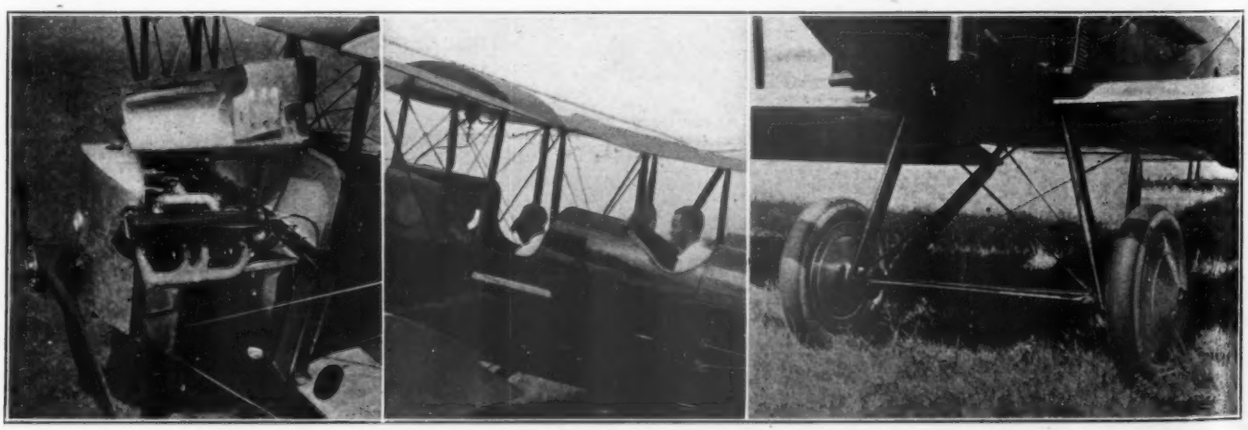


Fig. 2. Close-ups of the Lincoln-Standard LS5—left, the engine installation; center, the passengers' and pilot's cockpits; right, the landing gear

ribs are of the webtype. The ailerons are attached to the rear spars of the upper wings. The wing fittings are of the plate form. The inter-plane struts are attached to universal sockets, and secured with pins.

The wings are covered with a long fiber cotton and doped with four coats of acetate and two coats of nitrate dope pigmented with aluminum.

Tail Surfaces. The horizontal stabilizer is of the non-lifting type. It is constructed of wood and is braced with cables. The elevators are of wood built up on a continuous steel tube. The rudder is balanced and is constructed with a steel tube main spar and trailing edge and wood ribs.

Landing Gear. The landing gear is attached to the fuselage with hinge type fittings and is constructed of steel tubing and streamlined with Balsa wood. Two 30 x 5 in. wheels run on a nickle steel tubular axis 2¼ in. in diameter. The axle is not provided with guides but the action is limited by the ½ in. elastic cord wrapped on the spools to absorb the shock. Safety cable is also provided. The wheels are streamlined with aluminum covers.

Power Plant. The engine is the well known 8 cyl. Hispano-Suiza developing 180 hp. at 1750 r.p.m.

The cooling system consists of two side radiators with an expansion tank mounted between the cylinder blocks. The oil tank is mounted back of the motor. All the water, gasoline and oil lines are provided with flexible couplings. The exhaust is carried down at the nose of the fuselage, thus reducing the roar of the motor and eliminating the exhaust fumes from the cockpit. A booster magneto is provided for starting the motor.

GENERAL SPECIFICATIONS

General Dimensions
Span, overall, upper wing, 44 ft. 7 in.
Span, overall, lower wing, 32 ft.
Height, overall, 10 ft. 7 in.
Chord, 6 ft.
Gap, 6 ft.
Dihedral angle, 1 deg.
Sweepback, 5 deg.
Stagger, 5½ in.
Propeller clearance from ground, horizontal, 16 in.
Areas
Wing curve, RAF 3
Upper wing area, including ailerons, 267 sq. ft.
Lower wing area, 180 sq. ft.
Total wing area, including ailerons, 447 sq. ft.
Ailerons, two, each 21 sq. ft. Total, 42 sq. ft.
Elevator area, 22.8 sq. ft.
Stabilizer, 23.7 sq. ft.
Rudder area, 12 sq. ft.
Fin area, 4.6 sq. ft.
Weights
Total weight, fully loaded, 2922 lb.
Weight of machine empty, including water, 1735 lb.
Fuel, 287 lb.
Pilot, 180 lb.
Pay load, 720 lb.
Power Plant
Hispano-Suiza, developing 180 hp..
Propeller, Hamilton 751.
Radiators, two, side type.
Total water capacity, 10 gal.
Oil capacity, 5 gal.
Gasoline capacity, 42 gal.
Performance with full load
Speed, maximum, 92.8 mi./hr.
Speed, cruising, 86.0 mi./hr.
Speed landing, 34 mi./hr.
Climb in ten minutes, 5200 ft.
Radius of operation, 310 miles
Ceiling, 18000 ft.
Equipment
Equipment includes altimeter, clock, tachometer, oil pressure gage, water thermometer, gasoline gage, cockpit covers and propeller cover.
One Emergency Kit including: Complete set of tools, two valve assemblies, set of complete motor gaskets, 6 ft. ignition cable, several pieces of radiator hose, eight hose clamps, one oil strainer, one gasoline strainer, eight spark plugs, one set of magneto brushes and one carburetor float.

Russian Air Activities

During an aeronautical "propaganda week" recently held in Russia, a Soviet naval seaplane carrying two officers and a mechanic made a flight across Russia from Petrograd to Sebastopol.

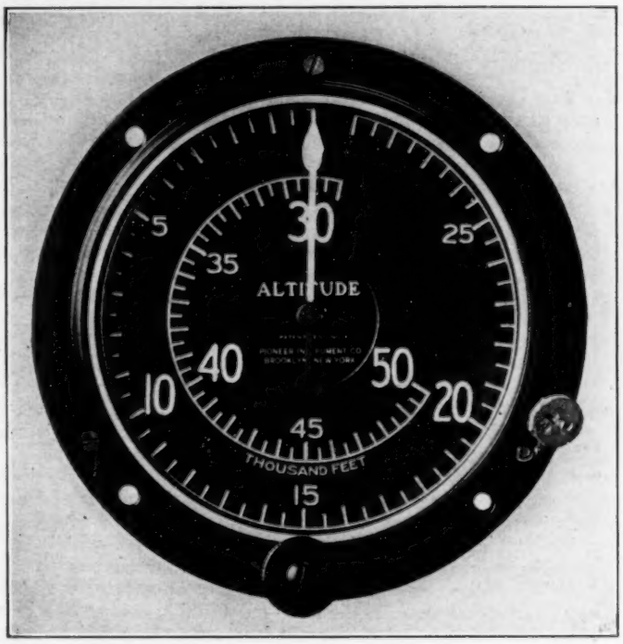
A squadron of Hanriot school planes, ordered by the Soviet government, has passed its acceptance trials at Orly airport, near Paris.

The Russion Commissariat of Posts and Telegraphs has decided to authorize the carrying of mails on the Moscow-Kharkoff-Kieff civil air lines. This service is to be extended to Rostoff and Odessa.

A 50,000 Ft. Altimeter

The Pioneer Instrument Co. of Brooklyn, N. Y., has just produced an aircraft instrument which is probably unique in the world. It is a 50,000 ft. altimeter, a small quantity of which have already been supplied to the Army Air Service. The new world's altitude which is just reported from France makes this acquisition extremely timely and gives hopes that if Sadi Lecointe's new performance is officially homologated, the Air Service will get right after this much prized record which America has been holding since the fall of 1921.

The difficulty of manufacturing and calibrating an altimeter indicating a height of 50,000 ft. will be appreciated when it



Made for world's records—the new 50 ,000 ft. altimeter produced by the Pioneer Instrument Co.

is stated that the pressure difference from 49,000 to 50,000 ft. is less than one fifth that existing between zero and 1000 ft. Hence, in order to secure a uniform scale, the mechanism of the 50,000 ft. altimeter requires a variable ratio of more than five to one.

While the Pioneer Instrument Co. does not anticipate any great commercial demand for an instrument of such an unusual range in the immediate future, it has nevertheless made up several instruments of this type beyond the requirements of the Air Service and is carrying them in stock.

Rickenbacker Glider Trophy

Capt. E. V. Rickenbacker has offered a trophy for the forthcoming annual International Glider Contest which, this year, will be held at Oakland, Calif. The Rickenbacker Trophy will be the prize for the principal "Sustained Flight" event and will go to the pilot who succeeds in remaining longest in the air with a motorless airplane.

The trophy will be awarded to the winner of each annual contest but will not become his property. Instead he will be given a certificate and a medal which shall testify that he won the trophy. In addition to donating the trophy, Captain Rickenbacker agrees to purchase the gliders which win first, second, and third places in the "Sustained Flight" event for $1,000, $500 and $250 each, respectively. This is on condition, however, that when signing his entry form the contestant signifies his willingness to sell his model in the event of winning. It is optional with the contestant whether he will accept Captain Rickenbacker's offer. On the other hand, if he does not accept it when entering, the offer is withdrawn so far as that particular entrant is concerned.

The International Air Congress, London, 1923

Interpretive Summary of Papers Read Before the Congress Covering All Phases of Aeronautics

The International Air Congress held under the presidency of Group Capt. the Duke of York by invitation of the British government June 25-28, last, in London, was attended by a large delegation representing British aeronautical interests as well as by official delegates and private members from Belgium, Canada, Chile, China, Denmark, France, India, Italy, Japan, the Netherlands, Norway, Poland, Rumania, Spain, Sweden and the United States.

This International Air Congress was the sixth in date. The first was held in 1889 in Paris, and this was followed by congresses in Chicago, Milan and Nancy, France. The last Congress again met in Paris, in 1921, when the President of the French Republic opened the proceedings in person. The objects of these congresses are to bring together leading representatives in aeronautical science from all parts of the world to review progress and to stimulate international endeavor in further development in all branches of aeronautics.

In order that all aspects of aeronautics receive adequate attention, the congress just held in London was divided into four main groups, which met simultaneously each day, under separate chairmen.

Group A dealt with aerodynamics, construction and research.

Group B considered the question of power plants, fuels and lubricants, and propellers.

Group C dealt with air transport and navigation questions.

Group D considered airships, both from the commercial and technical points of view.

Limitation of editorial space makes it unfortunately impossible even to give abstracts of all the numerous papers read before the Congress, although it is proposed to reproduce at a future date some of the more outstanding communications. However, in order that our readers may at once know the nature of the different contributions we are reproducing below by courtesy of *The Aeroplane* an excellent interpretive summary our contemporary published of the labors of the Congress. The proceedings of the Congress are eventually to be published in full.

Aircraft Standardization

MONDAY JUNE 25

MORNING SESSION

Group A. Standardization of Methods of Research. By Sir R. T. Glazebrook.

Dealt briefly with the differing types of wind-channels, and methods of measurement employed in various aerodynamical laboratories, and with the need for taking steps to remove the doubt which exists as to the comparative value of the results obtained by these varying methods. Described briefly the progress of the set of international tests which are now being made on certain standard models prepared at the N.P.L. with a view to discovering the degree of accord—or otherwise—between measurements made at various aeronautical laboratories. An appendix describes certain of the measuring appliances in use in this country.

(2) *Proposal for standardizing the methods of computing wing sections.* By M. A. G. von Baumhauer.

Draws attention to the practical difficulty of setting out in the drawing office the sectional shape of a wing section owing to the varied methods adopted by different authorities of defining the shape of wing profiles. Suggests the standardization of a method practically identical with that used by the American National Advisory Committee.

(3) *Standardisation de la Notation Mathematique de l'Aéronautique.* By Commandant E. Herrera.

Proposal for a systematic standardization of mathematical symbols for aeronautical purposes.

(4) *Les Alliages Ultra-léger en Aéronautique.* By MM. A. M. Porteven and R. de Fleury.

Deals with the advantages of ultra-light magnesium alloys as material for aeronautical construction. The authors show that these extra light alloys have an advantage over the heavier aluminum alloys on account of their greater volume, and consequently increased stiffness.

Contains a good deal of interesting information as to the qualities of such light metals.

(5) *Note sur la Determination de l'indice le l'essai Statique des Avions de Transport.* By M. Louis Bréguet.

The Section Technique Aérienne requirements for the strength of commercial aircraft are based on the loads which would be imposed by suddenly pulling out of a nose-dive at terminal velocity to the incidence of maximum lift. The wings of the airplane concerned are required to carry a sand load equal to these loads multiplied by a factor. This method is considered to be entirely empirical and to penalize clean machines with a high terminal velocity unfairly.

M. Bréguet suggests the substitution of a method based on the loads imposed on the machine by a wind of a definitely varying vertical velocity as a more rational method, and indicates that this method of computation would not penalize the production of machines of low resistance.

(6) *Les Enquêtes sur les Accidents d'Aviation, et les Enseignements d'en Tirer.* By M. F. Devaluez.

Analyses statistics as to airplane accidents in France during 1921 and 1922. The statistics apply to organized air lines, and to flying schools. As usual the majority of accidents are due to engine trouble. Errors of judgment on the part of pilots is the second most frequent cause, and unfavorable weather conditions a bad third.

Draws the obvious conclusions as to improvements necessary in the reliability of engines, the training of pilots, and in the provision of proper organization and equipment for flying in bad weather.

Group B. (1) *Airscrew Research in Great Britain.* By Dr. H. C. Watts.

Descriptive of work carried out since the war under the direction of the Airscrew Panel of the Aeronautical Research Committee. Gives a general résumé of the results of tests on a family of airscrews, and some notes on the theory of airscrews.

AFTERNOON SESSION

Group A. (1) *The Slotted Wing.* By F. Handley Page.

A record of the development of the slotted wing with very full data of the results obtained both with models and on full-sized machines. The theory of the slot is discussed briefly, the fact being that theory at present does not agree with observed facts. The possibility of an all-round improvement in both speed, climb, and ceiling by the use of slotted wings is indicated on theoretical grounds, and this improvement has been achieved in practice.

(2) *Apparatus and Equipment Recently Constructed in the Aerodynamics Department, National Physical Laboratory.* By R. V. Southwell.

Describes: (1) The new Duplex 7 ft. x 14 ft. wind-channel and its roof balances. (2) The continuous rotation apparatus for measuring rolling moments due to roll. (3) A new apparatus for testing airscrews. (4) A combined wind direction and speed meter, and (5) The 1/5 scale Bristol "Fighter" model with the electrically-driven air-screw which is now under test in the Duplex channel.

(3) *Aircraft Standardization.* By C. Le Maistre, Esq.

Describes the efforts made during the latter part of the war to arrive at an Inter-Allied set of standard specifications for aircraft materials and components and records the failure to reach an agreement owing to the cessation of the war.

Records the opinion that it would be advantageous to resurrect the International Aeronautical Standards Commission.

(4) *L'Unification et les Produits Standards dans L'Aéronautique.* By Col. Grard.

Describes the general form of standards instituted in France by La Commission Permanente de Standardization Française. Discusses shortly some of the difficulties of securing International Standards caused by the curiosities of British weights and measures.

Group C. (1) *Affichages des Renseignements Météorologiques dans les Aérodromes.* By Col. Delcambre.

Proposals for a standardized system of displaying meteorological information in a pictorial form.

(2) *Some technical problems concerning winter flying.* By Ing. T. Angström.

Based on Scandinavian experiences deals with the practical aspects of flying in cold countries.

(3) *Organisation du Balisage Lumineux Nocturne.* By Captaine E. Marcotte.

Discussion of the lighting of air routes. The normal type of lighthouse not thought suitable for aerial work. If the beam is to be made sufficiently intense to be visible at long distances it must be concentrated into a narrow angle. At sea this is immaterial for vessels are always at sea level. In the air the narrow beam covers only a limited altitude range. A combination of the usual rotation of the beam with a vertical oscillation is suggested. For thick fog a combination of acoustic and wireless signals is suggested.

International Air Law

(4) *De l'établissement du Droit International Privé de l'Air.* By M. E. Sudre.

Discusses the present unsettled state of affairs as to the jurisdiction possessed by any Sovereign State over aircraft in flight over its territories, and urges the need of an international agreement on the subject.

(5) *The International Air Navigation Convention*—Scandinavian Points of View. By Prof. T. H. Engstromer.

Raises objections to Article 5, which states that "no contracting State shall, except by special and temporary authorization, permit the flight above its territory of an air-craft which does not possess the nationality of a contracting State."

Also objects on principle to the fact that a permanent majority is assured to five Great Powers on the International Air Traffic Commission.

(6) *Suggested minor alterations in the International Air Navigation Convention.* By Capt. Lubeck.

Suggests certain minor alterations in the regulations as to the lighting of aircraft at night.

(7) *The Marking of Aircraft.* By Lt. Hj. Riiser-Larsen.

Raises the problem of reconciling the aircraft registration markings adopted by the International Air Navigation Convention with the call sign regulations adopted by the International Convention on Telegraphic Communication. Under I.C.A. regulations the registration sign of an aircraft is also its telegraphic call sign. In the allotment of registration lettering certain countries have been allotted markings which are inconsistent with the call signs allotted to that nation. Suggests that the letter group registration of aircraft should be abandoned in favor of a nationality letter and a registration number.

WEDNESDAY, JUNE 27

MORNING SESSION

Group A. (1) *Fundamentals of Fluid Motion in relation to Aeronautics.* By Prof. L. Bairstow.

Suggests the possibility of appreciable advance in the theory of aerodynamics by the combination of the Prandtl circulation hypothesis with the equations of viscous fluid motion.

(2) *Some Aspects of Modern Aerofoil Theory.* By H. Glauert, Esq.

A brief outline of the Prandtl theory of aerofoils with notes on its application to practical problems.

(3) *The Circulation Theory of Lift.* By Major A. R. Low.

An account of the method by which the flow pattern round any aerofoil may be derived from that round a cylinder by graphical methods and the lift on the aerofoil calculated. The results so obtained are in fair agreement with experimental measurements.

(4) *Sur la Résistance des Fluides.* By M. D. Riabouchinsky.

Describes certain solutions for the movement of a viscous fluid past material obstacles.

Group B. (1) *A Survey of recent work at the Research and Experimental Department of the R.A.E.* By Wing Cmdr. Hynes.

Relates to the work carried out at Farnborough on engines and their accessories.

(2) *The Crude Oil Aero Engine.* By A. E. L. Chorlton. Esq. An analysis of a general nature of the mechanical problems to be overcome in the development of the crude oil injection aero-engine.

(3) *Some Problems of Static Radial Air-Cooled Aero-Engines.* By A. H. R. Fedden, Esq. Outline of the advantages of the air-cooled radial engine, together with some discussion of the special difficulties of the type, such as cooling difficulties, valve troubles, tendency to high fuel and oil consumption, big-end troubles, etc.

The problems of maintaining power at altitudes with this type are also discussed.

Air Mail Services

Group C. (1) *Air Mails.* By Brig.Gen. F. H. Williamson. A review of the British Post Offices' experience with air mails and of the deductions to be drawn. These are generally that over short distances—that is for internal services and for mails to the nearer European countries—there is little to be gained by the use of air mails. So small a proportion of the total mail is really urgent that only a very small volume will bear the extra charge. Where an air mail service can operate in such a way as to give a really large saving of time—as for example when an air service allows a letter to catch an earlier steamer at a distant port or in cases such as the Baghdad mail where weeks can be saved—a considerable volume of mail may be expected to bear a surcharge of air carriage. But even so it is doubtful if it will bear charges that would render the service a paying proposition as a mail service alone.

Parcels traffic, particularly to countries where ordinary parcel post facilities are poor, are more promising—but generally the opinion is held that air mails will not become common until passenger and goods services by air have developed considerably.

The importance of complete reliability of service for postal work is insisted upon.

(2) *Transport du Courier.* By Jonkheer Van den Berch Van Heemstede. A plea for the more regular use by the Post Offices of air transport facilities for ordinary mails.

Suggests that the surcharge for the use of air mails should be abolished and that ordinary letters should—as far as possible—be sent by airplane.

Civil Aviation

(3) *The Development of Civil Aviation.* By F. Handley Page, Esq., and W. P. Savage, Esq.

A review of the progress made during the past three seasons in the operation of British air lines—more particularly the Handley Page services. Gives statistics of regularity and some analysis of the causes of engine failure. Concludes with a consideration of the improvements which are possible and desirable in the design of commercial aircraft.

(4) *Commercial Aircraft and the State.* By Cecil L'Estrange Malone, Esq.

Criticizes the "Hambling" scheme on the grounds that it does not provide for co-operation with routes run by other nations, proposes a monopoly, takes no account of marine aviation and provides a sum inadequate for proper development over a period of ten years.

Suggests three routes and three companies—(a) a trans-Europe route to India and ultimately Australia, (b) to South Africa, and (c) across the Atlantic, the latter operating at first with aircraft-carrying liners.

Suggests that capital to the amount of £1,500,000 for (a), £2,000,000 for (b), and £500,000 for (c), together with subsidies for the necessary aircraft ships would be required, and that a State liability for £250,000 p.a. to cover interest on the necessary capital would be sufficient to secure the desired results and to carry out extensive research work in addition.

(5) *Le Nouveau Laboratoire à Depression Atmospherique et à Basse Temperature du Bourgêt.* By Dr. P. Garsaux.

Description of the low-pressure and low-temperature chamber installed at Le Bourget to study the psychological effects on flying personnel of high altitude conditions.

AFTERNOON SESSION

Group A. (1) *The Technical Development of the Airplane.* By J. D. North, Esq.

A brief review of the phases through which the technical development of the airplane has passed, and a review of the lines of development which may be expected in the future. A very usefully suggestive paper.

(2) *The Testing of Aircraft Structures and Components.* By W. D. Douglas, Esq.

A review of the value and of the methods of testing aircraft and aircraft components under load in the light of experience at the Royal Aircraft Establishment.

(3) *The Stability of Oscillations of an Airplane Wing.* By MM. A. G. von Baumhauer and C. Koning.

Report on mathematical and experimental investigation of a case of violent and unstable oscillation of an airplane wing caused by aerodynamic forces.

(4) *Control at Low Speeds.* By R. McKinnon Wood, Esq.

A review of the problem of securing lateral and directional control at stalling angles, with some account of results achieved at Farnborough.

(5) *Experimental Determination of Airplane Stability.* By Maj. T. M. Barlow.

Description of the method employed at Martlesham Heath Test Station to determine the stability of full-sized aircraft, with some specimens of the results obtained.

(6) *Longitudinal Stability, Controllability and Maneuverability of Airplanes.* By Prof. E. P. Warner.

A very clear and practical discussion of the often conflicting requirements in regard to these three intimately connected qualities.

Aero Engines

Group B. (1) *The Development of Aero-Engine Materials.* By Dr. L. Aitchinson.

A review of the qualities of metals as expressed by the ratio of their fatigue range to their density. Also contains a plea for the abandonment of castings of all kinds in favor of wrought material, on account of the intrinsic superior reliability of wrought metals.

(2) *Researches on the Alcohol Internal Combustion Engine.* By Prof. E. Hubendick.

A report from the Internal Combustion Engine Laboratory at the Royal Institute of Technology, Sweden, dealing with the properties of an explosive mixture of alcohol, vapor and air, with deductions as to the carburation of alcohol and as to the compression ratio that should be employed in an alcohol engine.

Group C. (1) *La Navigation Aérienne en France.* By Captain Volmerange.

A review of the developments made in navigational appliances in France recently. States that opposition on the part of pilots has limited the practical development of instrumental navigation. Discusses briefly some of the problems of mapping by aerial photography.

(2) *Navigation Equipment for Long-Distance Flights.* By Maj. H. E. Wimperis.

A description of navigational instruments at present in use in Britain.

(3) *L'Emploi des Méthodes de Navigation est Indispensable au Succés des Transports Aériens Commerciaux.* My M. A. B. Duval.

Points out that regular and punctual operation to a fixed time-table is an indispensable feature of successful commercial transport, and that only proper methods of navigation which will permit of flying a direct course independently of the vagaries of the weather and allow the maintenance of air services at the necessary degree of regularity should be permitted.

FRIDAY, JUNE 29

MORNING SESSION

Group A. (1) *The Reliability of Model Data.* By R. McKinnon Wood, Esq.

Discusses the practical aspect of the correspondence between model tests and full-scale results. Shows that for the usual type of thin-winged biplane model tests give fairly accurate results. With thick high-lift wings the accuracy is not good.

(2) *Méthode d'Expérimentation et Utilisation des Résultats Obtenues sur Modèles.*

A study of the applicability of model tests to full-scale work. Discusses scale effect, the influence of model supports, interference effects and some of the difficulties of full-scale measurement.

Lubrication Problems

Group B. (1) *The Nature of Lubrication in Engineering Practice.* By Dr. T. E. Stanton.

An account of experiments on the lubrication of bearings in which relative reciprocal movement occurs and in which the formation of a continuous film of oil of sensible thickness is impossible. Confirms the superior lubricating qualities of organic lubricants over mineral oils in these cases, and the importance of grooving of the bearings.

(2) *Some Physical Properties of Lubricants.* By A. E. Evans, Esq.

A technical discussion of the bearing of the physical qualities of oil on their practical value as lubricants.

(3) *Viscosity of Lubricants at High Temperatures and Pressures.* By M. D. Hersey, Esq.

Report on results of experiments on a number of oils at temperatures 22 deg. C. to 100 deg. C. and pressures up to 50,000 lb. per sq. in.

Group C. (1) *Aviation Insurance.* By A. L. Sturge.

A review of Aviation risks from the point of view of the Insurance Co.

(2) *The Design of Commercial Aircraft.* By Maj. R. H. Mayo.

(No copy of paper available.)

Group D. (1) *The Commercial Aspect of Airship Transport.* By Maj. G. H. Scott.

A short treatise on the present capacities of the airship and the rôle which it can fulfil as a long-distance carrier of mails and passengers.

(2) *The Hulls of Rigid Airships.* By Lt. Col. V. C. Richmond.

A lengthy and intricate discussion of the calculation of stresses in the hulls of rigid airships, based on the investigations of the British Aeronautical Research Committee.

AFTERNOON SESSION

Group A. (1) *Note sur la Résolution graphique des Equations du Vol Horizontal.* By Commandant Alayrac.

(Paper not available at time of going to press.)

(2) *Méthode Graphique Permettant le Trace d'Ailes d'Avions.* By M. E. Royer.

Note on a method of deriving cambered wing sections from a symmetrical streamline section by curving the median line behind the maximum ordinate.

(3) *Note sur le Calcul des Ailes d'un Avion.* By Prof. Mirea.

Suggests a standard method of computing the grading of the loading along the span of an airplane wing for stress analysis.

(4) *The de Bothezat Helicopter.* By Prof. de Bothezat.

A very brief description of the scheme of this machine and a note as to the flights made.

Aviation Fuels

Group B. (1) *Aviation Spirit—Past, Present, and Future.* By Dr. A. S. Dunstan and Dr. F. B. Thole.

A description of the deterioration in the qualities of gasoline which have resulted from the enormous growth in the demand for this fuel. This deterioration is particularly marked in regard to aviation owing to the increasing tendency of the heavier fuels to detonate. The paper surveys the field of anti-detonating fluids which may be called in to overcome this difficulty.

(2) *Les Carburants et les Industries des Lignites.* By Capt. E. Marcotte.

Briefly mentions some of the possible methods of obtaining fuel for aircraft from low-grade coals.

Group C. (1) *Aerial Surveying.* By Prof. B. Melvill Jones.

Discusses some of the practical difficulties of making an

accurate aerial survey. Gives the result of experimental work carried out at Cambridge and draws therefrom some conclusions for the guidance of those who wish to practice this art.

(2) *Aerial Navigation and Japan.* By Maj. W. Jikemura. (No copy of paper available.)

Group D. (1) *Recent Progress in Airship Construction in Italy.* By Ing. U. Nobile.

Describes the S.C.A., O.S., and P.M. types of semi-rigid airship built in Italy in the past eighteen months, with particulars of the improvements on previous types incorporated. Finally gives details of the design of the "N" ship now under construction.

(2) *The Effect of Bow Stiffeners on Non-Rigid Airships.* By Prof. E. P. Warner.

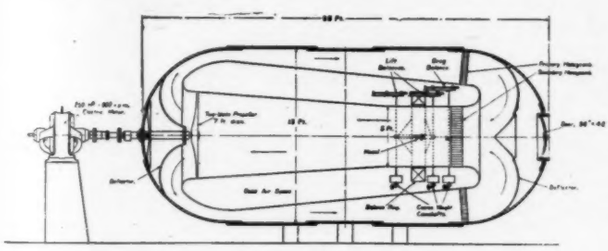
Discussion on the pressures encountered on the nose of an airship and the necessary stiffness which must be provided by bow stiffeners to keep the nose in shape.

Studying Scale Effect

It is a well known fact that the wind tunnel data obtained from scale models do not strictly apply to full sized airplanes, and that in order to make these data applicable to the latter certain corrections have to be made.

In the Wilbur Wright Lecture given May 31, 1923, in London, England, Dr. Joseph S. Ames, professor of physics at the Johns Hopkins University and chairman of the executive committee of the National Advisory Committee for Aeronautics, gave an interesting description of the work the N.A.C.A. is carrying on for the purpose of studying scale effect. This effect is studied at the Langley Memorial Laboratory at Old Point Comfort, Va., by four different methods two of which are believed to be unique. Dr. Ames said:

"We have an ordinary wind tunnel, having a 5 ft. throat and fitted with fans so that an air-speed of 100 m.p.h. (147 ft. per second) may be used; this gives a certain Reynolds number, not very large. A larger number may be obtained



N.A.C.A. variable density wind tunnel

by a free flight method in which a large model is suspended below an airplane in steady flight; we have perfected methods for suspension and measurement, and the results are, on the whole, satisfactory. To secure a still larger Reynolds number, the Committee has had constructed during the past year a wind tunnel to operate with air compressed to 20 atmospheres or more. The tunnel proper is 5 ft. in diameter at the experimental chamber, and is enclosed in a cylindrical tank with hemispherical ends. The walls of the tunnel are hollow, providing an annular dead air space in which the balance mechanism is installed. This may be controlled automatically, or settings may be made by small electric motors, operated from outside, which attach or release heavy balancing weights by means of cams, or shift lighter weights along balance arms. The model is attached to the balance by wires, there being three balance arms for measuring lift, drag and pitching moments. The tank is 35 ft. long and 15 ft. in diameter, and weighs 83 tons. It is mounted on a concrete foundation and is partially surrounded by a working platform. An observer on this makes settings and readings by looking into the tank through small glass windows. The density of the air in the tank is controlled by two compressors driven by electric motors. Continuous stages may be secured from one-tenth of an atmosphere to twenty atmospheres. Circulation of air is effected by a two-blade propeller of special design, 7 ft. in diameter and driven at 900 r.p.m. by a 250 hp. synchronous motor mounted on a separate foundation outside the tank. The drive shaft is made tight against air leakage where it passes through the head of the tank by a loosely packed gland, through which oil is circulated.

"The concept of such a tunnel was originated by Dr. Max M. Munk, and this particular one was designed by him; and the mechanical equipment was designed and installed by Mr. D. L. Bacon, both members of the Staff of the Committee. The latter is in charge of the operation of this tunnel as well as of other tunnels in the Committee's laboratory.

"It may be of interest to note that when the tunnel is operating at its greatest density, it is equivalent in scale to a tunnel 100 ft. in diameter running at 60 m.p.h. It takes about an hour and a half to "inflate" the tank fully.

"Another method for obtaining a large Reynolds number, which is used by the Committee, involves the accurate measurements of the motion of an actual airplane in flight. To this end the Staff of the Committee have perfected a large number of recording instruments. Among these may be mentioned a single-component accelerometer; a three-component accelerometer; a three-component angular velocity recorder; a control-position recorder; a control-force recorder; an air-speed meter; an angle of attack recorder, and an electric chronometer. The Committee owes the design of these instruments to the exceptional ability of two of its staff, F. H. Norton and H. J. E. Reid."

In concluding his lecture, Dr. Ames said: "If the use of these scale effect methods justifies our present hopes, we shall be able in a comparatively short time to place at the disposal of the designer of aircraft a wealth of information which should increase markedly the accuracy of his work."

International Helicopter Prize

The Aero Club of France offers a prize of F. 10,000 for the first helicopter which will cover a closed circuit of one kilometer (0.62 miles) circumference at a height of not less than one meter (3.28 ft.) over the ground. The machine must take off within a circle of ten meters circumference, the center of which must coincide with the projected center of the pilot's seat, and the machine must also land within this circle. The height of the machine over the ground will be measured by means of a rope weighted two kilograms, and having a length of one meter clear of the lowest portion of the helicopter. The length of the circuit will be measured by means of a pole situated at a distance of 500 meters from the take off circle, and in the direction desired by the contestant, who will have to turn around this pole. The machine must land without any mechanical breakage, and this will be verified by compelling the machine to rise to a height of one meter within 15 min. after the completion of the circuit flight.

The competition is international and will be held under F.A.I. rules. The entry fee is F. 200 per machine, and is not returnable. For more ample particulars apply to the Aero Club of France, 35 rue François Premier, Paris.

French Aircraft Activity

A significant indication of the activity of French aircraft designers was recently furnished by General Hirschauer, now a Senator, and before the Great War the director of military aeronautics in France. In an article on the technical progress of French aviation, published by *Les Ailes*, General Hirschauer states that during 1922 the *Service Technique*—which corresponds to the Engineering Division of the Air Service in this country—had submitted to it the following numbers and types of aircraft designs: 70 land planes, two gliders, two helicopters, 48 seaplanes and 25 aircraft engines.

Following the examination of these designs, contracts were passed for the manufacture *by the private industry* of 23 land planes, two gliders, two helicopters, 21 seaplanes and 16 aircraft engines.

The Curtiss Rib Testing Machine

Improved Wing Testing Method Now Available to Other Manufacturers

Believing that the present method of statically testing airplane ribs could be greatly improved, the Curtiss Aeroplane and Motor Co. of Garden City, N. Y., has built and thoroughly tried out a machine for this purpose. The apparatus is now available for use to manufacturers and experimenters who have work of this nature to perform.

The accompanying illustration gives a general idea of the construction of the machine.

The capacity of the machine relative to the size of the rib that can be tested allows a chord length of 180 in. and a maximum ordinate of about 30 in. Any reasonable wing loading with its accompanying factors of safety is amply provided for.

The supports for the rib are so constructed that the rib may easily be plumbed and at the same time be free to rotate about its beam centers. The vertical guides, to prevent undue transverse distortion, are adjustable in two directions, allowing a minimum spacing of 4 in. lengthwise of the rib and a variation of ⅜ to 1¼ in. transversely.

The loads which may be varied in amount are applied by means of sliding shot cups mounted on graduated lever arms, the arrangement being such that the loads are moved simultaneously by means of a hand wheel located at one end of the machine. The load is applied to the rib by vertical rods provided with shoes at the ends where they come in contact with the rib. The length of the rods is adjustable to allow for the deflection of the test specimen. The direction of the loads is easily reversed as in the case of the nose load in a high speed condition, by simply extending the lever arm on the other side of the machine. The arms are balanced at the start of the test by means of sliding lead counter weights. The effect of a uniform load is obtained as nearly as possible by accurate location of the loading arms and the use of distributing blocks under the shoes.

Cantilever ribs such as those of control, surfaces are mounted on the verticals at either end of the machine and the loads applied as explained above.

Many Advantages of Method

The advantages of testing ribs by this method over other methods commonly in use are numerous:—

(1) Any type of rib may be tested, be it from wings, tail surfaces or control surfaces.

(2) Where several ribs of one kind are to be tested the whole job may be done very quickly which gives the desired results at a minimum cost.

(3) As it is necessary to weigh out only one set of loads no matter how many factors are required, accuracy of weights is obtained and therefore efficiency.

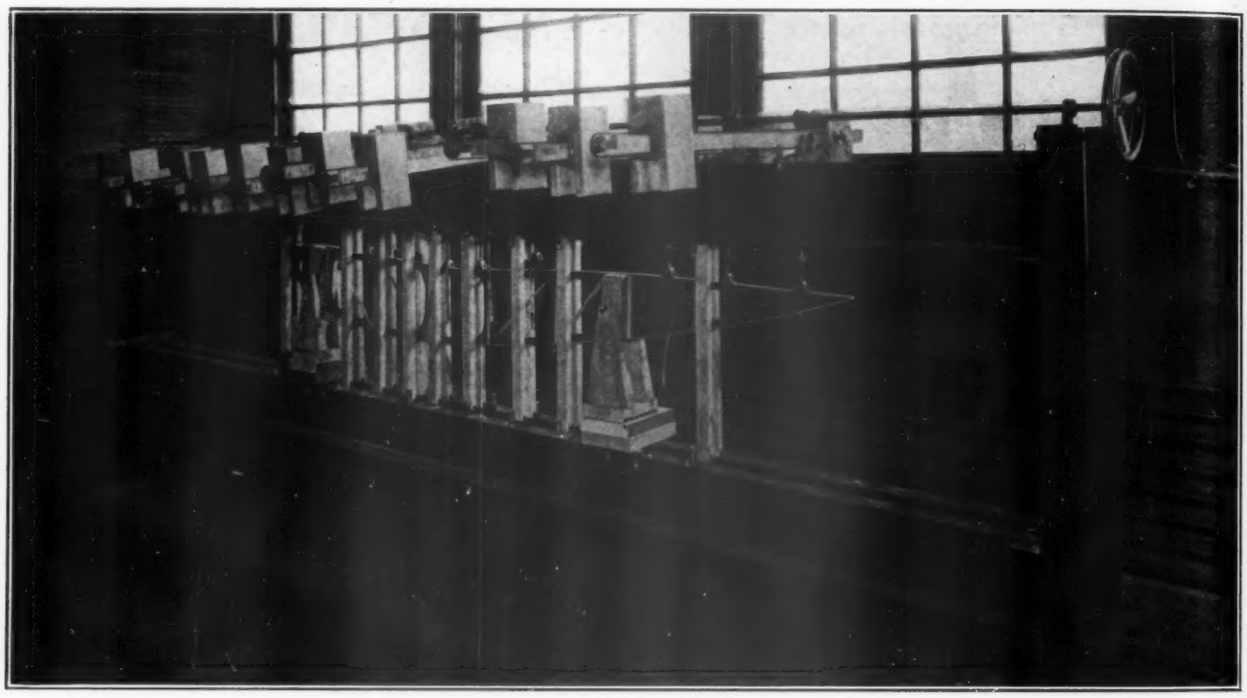
(4) The machine is very simple and easy to operate during the test which allows the attention of the operator to be concentrated on the rib.

(5) Owing to the accessibility of the rib while in the machine, the failures are easily detected and due to the stops on the weight arms the rib is not completely destroyed after the initial failure as is the case with some methods.

(6) The loads are applied simultaneously, thus simulating as closely as possible actual loading conditions.

(7) Perhaps one of the most unique features of this method is the opportunity it offers in the case of wooden ribs of changing the strength of the rib while it is being tested. For example, suppose that a rib is found to be considerably overstrength, then we may cut down the section of the diagonals, verticals, or webs while the rib is still in the machine. Thus we may practically design the rib while under load.

(8) The reverse loads may be easily applied without extra complicated or bothersome apparatus such as pulleys, etc.



General view of the Curtiss wing rib testing machine

AIRPORTS AND AIRWAYS

This Department is concerned with all civil flying activities such as the establishment of airports, the marking of airways, warnings to airmen regarding obstructions, experiences gathered on flying routes and landing fields, the work of commercial aviation companies and private fliers, the formation of new air transport enterprises, personal paragraphs of general interest, etc.

Communications to this effect, addressed "Airways Editor, Aviation, 225 Fourth Ave., New York City", should be brief, accurate and to the point. They should deal with facts, not with theories or speculations. While American civil flying activities will naturally be given prominence, communications will also be welcomed from Canada, Mexico and other parts of the Western Hemisphere. EDITOR.

Detroit Air Board Election

At an organization meeting held by the Detroit Air Board Aug. 6 in the Board of Commerce building, permanent officers were elected, and C. Goodloe Edgar, chairman, was instructed to name a committee to study proposed sites for one or more municipal airports.

The Detroit Air Board is a federation of aeronautical, civic, military and engineering organizations for the sake of according their efforts toward making Detroit the countrys' aviation center.

The following officers were elected: Chairman, Gen. C. Goodloe Edgar; first vice-chairman, Gen. Edward G. Heckel, commissioner of parks and boulevards; second vice-chairman, E. W. Hamman; secretary, W. A. Mara; treasurer, C. W. Harrah; governors, Sidney D. Waldon and Harold H. Emmons, representing the Detroit Aviation Society; Joel R. Moore and V. M. Dumas, representing the Veterans of Foreign Wars; John F. Roehl, representing the American Legion; Lent D. Upson and Joseph A. Martin, representing the City; Eddie Rickenbacker and William B. Stout, representing heavier than air activities; Ralph H. Upson and Carl B. Fritsche, representing lighter than air activities; John W. Smith, representing the postoffice; C. F. Redden and Roland Rohlfs, representing the Aeromarine Airways, Inc.; J. G. Vincent and Milton Tibbetts, representing the Packard Motor Car Co.; James E. Degan and Albert C. Grace, representing the Vortex Club; Jeff Webb and Paul H. King, representing the Rotary Club; Emens B. Wisner and Sam T. Rockwell, representing the Exchange Club; Edsel B. Ford and William B. Mayo, representing the Ford Motor Co.; A. A. Meyer, representing the Associated Technical Societies of Detroit; H. W. Alden, representing the Aviation Country Club; L. M. Kunze, representing Air Service Veterans; Max R. Baedeke, representing the Michigan National Guard; Francis Sward, representing the Reserve Officers' Association; K. L. Moore and J. G. Rankin, representing the Reserve Air Service; Harvey J. Campbell and George Walbridge, representing the Detroit Board of Commerce; Guy W. Moore and Carl Nachtagal, representing the U and I Club; C. B. Squier, representing the Detroit Flying Club.

Howard E. Coffin was made honorary chairman.

Helicopter Performances

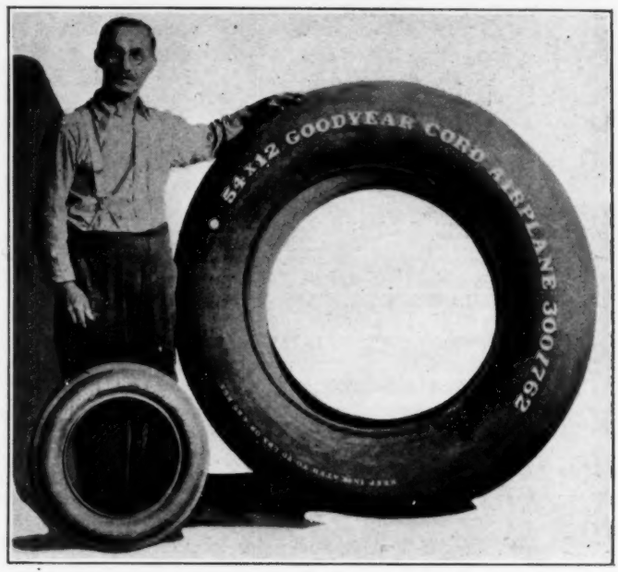
M. Pateras Pescara, the inventor of the helicopter bearing his name, is continuing his experiments at Issy-les Moulineaux, near Paris, with marked success. He is now practicing straight and circular horizontal flights with a view to qualifying for the 10,000 francs prize offered by the Aero Club of France.

Some noteworthy performances of the Pescara helicopter include a straight flight of 200 m. length, another of 460 m., and a circular flight of 650 m. circumference, with the machine landing in a circle of ten meters diameters from which it took off.

The trials of the Oehmichen helicopter are also proceeding satisfactorily, a hovering flight of 5 min. 15 sec. having recently been accomplished before representatives of the French air department.

The Largest Airplane Tire

Probably the largest airplane tires ever built were produced by the Goodyear Tire & Rubber Co. for the Barling Bomber, and are shown in the accompanying illustration. These tires, which support a load of 10,000 lb. each are 54 in. by 12 in., with smooth treads, and are inflated to 70 lb. air pressure. The Barling Bomber weighs complete approximately 40,000 lb. and the landing gear which must carry this huge weight is equipped with seven tires of the type above described.



Giant tire, one of seven built by the Goodyear Tire & Rubber Co. for the Barling Bomber

"Cherub" Passes 50 hr. Test

The "Cherub" engine manufactured by the Bristol Aeroplane Co., Ltd., of Bristol, recently passed the 50 hr. test prescribed by the British Air Ministry.

Although the schedule only called for five non-stop runs of 10 hr. each, under 90 per cent full power, this engine performed a continuous run of 50 hr. and developed an average of 15.4 hp. at 2,200 r.p.m., under 90 per cent full power. The average fuel consumption for the entire time was 9.7 pints per hour, and the oil consumption 0.63 pints per hour. At the conclusion of the long run the manufacturers made a further demonstration of the reliability of the plant by running it for an additional hour with wide-open throttle. The power output was 18.5 hp. at 2,200 r.p.m. At the completion of the tests the engine was entirely dismantled and found to be in a generally perfect condition.

The engine is of the 2 cylinder horizontal opposed type and air-cooled through the medium of a belt driven fan connected directly to the crank shaft.

Foreign Pilots Enter Meet

L. L. Carter, winner of the recent British Aerial Derby, will be a contestant in the International Air Races at St. Louis, Oct. 1, 2 and 3. Assurance to this effect was received Aug. 17 by the St. Louis Air Board in a cable from the Royal Aero Club of London.

Carter's entry insures a thrilling contest for the Pulitzer Trophy, the world's air classic for speed, between the leading aces of America, Great Britain, France and Italy. Lieut. Russell Maughan, U.S.A., now holds the trophy, won at Detroit last year, as well as the world's speed record established at Dayton, Ohio, March 29, 1923. Both trophy and record are threatened by the foreign invasion, however.

Among the contestants in the Pulitzer Trophy race, which will be held at St. Louis Field, Oct. 3, in addition to Carter, the Englishman, and Lieut. Maughan, will be Brack-Papa and Mainardi, the leading Italian aces, and probably Sadi Lecointe, holder of the French speed and world's altitude record. The United States Navy has entered Lieuts. S. W. Callaway and H. J. Brow, Ensign A. J. Williams and 1st Lieut. L. H. Sanderson (Marine Corps) in this race. The Army has not yet named its entries, in addition to Lieutenant Maughan, but it will have a strong personnel.

Carter will probably fly the Mars Bamel Gloucestershire racer, equipped with a 450 hp. Napier-Lion engine. In the British Aerial Derby, Aug. 6, which he won, Carter made a speed of 192.4 mi./hr. in this ship. The plane has done 212 mi./hr. in special trials, however. It is admitted the winner of the Pulitzer trophy race at St. Louis must fly faster than 200 mi./hr. At Detroit last year Maughan's greatest speed was 205.

The Navy is building two new ships for this year's race, which may develop a speed of 250 mi./hr. The Italians have planes equipped with 700 hp. Fiat engines, and Sadi Lecointe flies a Nieuport with Hispano engine of 320 hp.

In addition to the Pulitzer trophy race, there will be eight other major events in the three days' racing program, there being classes for all kinds of airships, including both military and civilian pilots.

In the On-to-St. Louis races, prizes will be awarded to pilots flying the longest distance to St. Louis to attend the races. Total cash prizes offered amount to $13,300, as well as many cups and valuable trophies. The St. Louis Air Board is spending $200,000 equipping St. Louis Field, where the races will be held, as a permanent airport.

Navy out for St. Louis Honors

Lieut. Comdr. Marc A. Mitscher, U. S. Navy, who will be in command of the Naval Unit at the October Races, was in St. Louis, Aug. 3 and 4, and after inspecting the field, expressed satisfaction with the progress made. Commander Mitscher will bring the navy fliers to St. Louis Field for intensive training about Sept. 10. It is no secret that the Navy intends to win its share of the honors in the races this fall.

The Navy contestants entered for the different races follows:

Pulitzer Trophy Race
- Lieut. S. W. Callaway, U.S.N. .....TX plane
- 1st Lieut. L. H. Sanderson, U.S.M.C. ....TX plane
- Ens. A. J. Williams, U.S.N.....CR plane
- Lieut. H. J. Brow, U.S.N.....CR plane

Liberty Engine Builders' Race
- 2nd Lieut. G. B. Hall, U.S.M.C.....UC-1 plane
- Lieut. (jg) D. C. Allen, U.S.N.....18-T plane

Merchants' Exchange Trophy Race
- Lieut. (jg) M. A. Schur, U.S.N.....DT-4 plane
- Boatswain E. E. Reber, U.S.N.....DT-4 plane

When asked the question "How much speed do you expect these ships to attain?", Commander Mitscher said:

"It is possible that the speed will be greater than that made in the Pulitzer race last year. Further than that, I do not wish to comment."

Closing Dates for St. Louis Entries

Free entries in the St. Louis races will close Sept. 1. Twenty-five per cent penalty entries will not be received after Sept. 8, while 50 per cent penalty entries close Sept. 15. After Sept. 15 entries will only be accepted with the consent of the other entrants.

Publicity Campaign for Air Meet

A publicity campaign to cover the entire country, but intensively as regards the St. Louis trade territory, by means of newspapers, magazines, trade publications, posters and billboards was authorized by the executive committee of the St. Louis Aeronautic Corporation last week. Airplanes will carry speakers and literature to all important cities and gatherings within 300 miles of St. Louis during the next six weeks.

High Performance Mail Ship

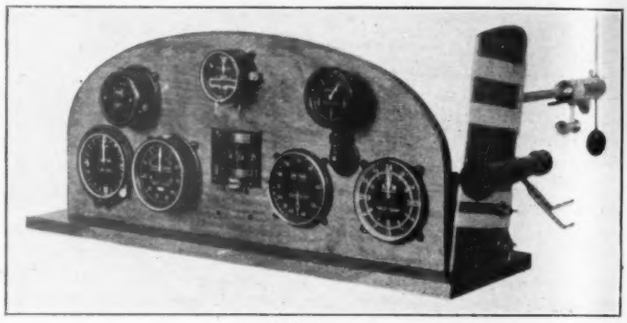
The Air Mail has rebuilt the special mail ship widely known in the service on account of its maternal lines. The Aeromarine high lift wing has been retained, while the fuselage has been completely redesigned.

The rebuilt ship is said to have an exceptional performance and to have attained a speed of 120 mi./hr. with a mail load of 1000 lb. Constructional and other details will be printed in a forthcoming issue of AVIATION.

Pioneer Instruments at Gothenburg

Owing to the enterprise of the Pioneer Instrument Co. of Brooklyn, N. Y., the American aircraft industry was not totally absent from the International Aeronautical Exposition held at Gothenburg, Sweden. The exhibit of the Pioneer company consisted of the latest type of instrument board manufactured by this firm, which is shown in accompanying illustration.

This board is equipped as follows: in the center is the standard type of American aircraft compass which has both



Instrument board exhibited by the Pioneer Instrument Co. at the Gothenburg Aero Exposition

a horizontal and a vertical rose, so it can be read from top side as well as from front or back. Over the compass is the Pioneer-Sperry turn indicator, to which power is supplied by the Venturi tube mounted on the extreme right of the board. To the right of the turn indicator is a fuel level gage, and under it are a Pioneer air speed indicator which is operated by the Pitot static tubes mounted on the wing strut element, and a tachometer. The three instruments to the left of the compass are, on top, an air distance recorder, which is actuated by the paddle shaped transmitter mounted on the wing strut; on the left, an altimeter of a new type mechanism with a cell having an internal spring; and on the right, a Rate of Climb Indicator which enables the pilot to climb as fast, or descend as slowly, as possible without danger of stalling.

Secretary Denby Will Attend Races

Secretary of the Navy Edwin Denby has notified the St. Louis Air Board that he expects to attend the International Air Races, Oct. 1, 2 and 3. Secretary Denby will also be one of the principal speakers at the annual banquet of the Aero Congress, to be given Oct. 1, at Hotel Statler, in St. Louis under the auspices of the National Aeronautic Association. Other speakers invited include: Secretary of War John W. Weeks, Postmaster General Harry C. New, Secretary of Commerce Herbert C. Hoover, Gen. John J. Pershing, Arthur Brisbane, and Congressman Samuel E. Winslow of Massachusetts.

Sadi Equalled Macready's Mark

According to an official statement issued Aug. 16 by the Aero Club of France, Sadi Lecointe in his altitude flight made Aug. 8 exactly equalled the world's altitude record made by Lieut. John A. Macready, A.S., when on Sept. 28, 1921, he reached an altitude of 10,518 m. (34,509 ft.)

First reports of Lecointe's altitude flight stated that his two barographs registered 11,000 m. and 10,800 m., respectively, and that it was consequently believed that Macready's record had been broken by the French flier. However, as AVIATION intimated last week, these figures yet required the usual corrections for instrumental error and temperature variation, which explains the discrepancy between the figures first announced and the official mark homologated by the Aero Club of France.

In a previous flight made Aug. 1 (and not Aug. 2, as was erroneously stated) Sadi Lecointe reached a corrected altitude of 10,127 m., while subsequent press dispatches announce that on Aug. 14 the French flier once more repeated his altitude attempt without, however, bettering the mark made Aug. 8, for his barographs again showed an uncorrected altitude of 10,800 m.

The reason why Sadi's best altitude mark exactly equals that of Macready—which may seem strange at first sight—is that the altitude is calculated on the basis of a barometric pression table.

Sadi used in his various attempts a special Nieuport-Delage biplane fitted with a 350 hp. Hispano-Suiza engine. The fuselage of this ship is the same as that of the Nieuport 40 pursuit biplane and the "sesquiplane" with which several speed records were made last year. The wings, however, have a much greater area than on the two speed ships, the total wing area being 34 sq.m. The span, 14 m., is unusually large for the length of the ship, which is only 6.60 m. and gives an aspect ratio of 11. The interplane struts are duralumin tubes. A noteworthy feature of this machine is that the landing gear has no shock absorbing device whatever, which may seem an innovation, although as a matter of fact Roland Garros in 1913 also used such a landing gear in one of his altitude record flights.

The Hispano-Suiza engine of Sadi's ship, developing approximately 350 hp. and fitted with Lamblin radiators, has no turbo-compressor or booster device. The weight of the machine, loaded, is 948 kg.

New Night Flying Mail Plane

On Aug. 20 delivery was made by the Aeromarine Plane & Motor Co., of Keyport, N. J., to the Air Mail at Hazelhurst Field, L. I., of the first special night flying ship produced by that company.

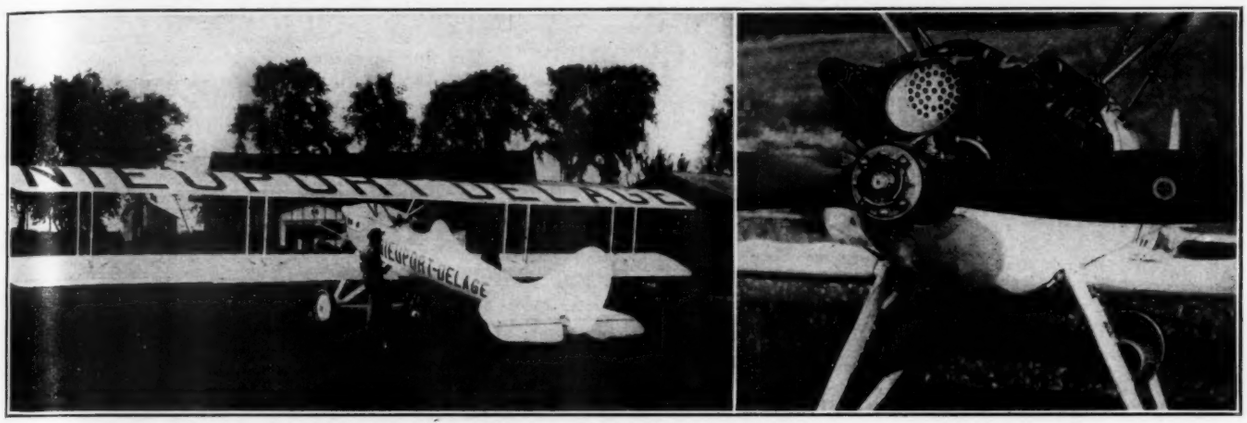
The plane is from designs of Paul Zimmerman, Aeromarine engineer. The fuselage is entirely of metal while Aeromarine high lift wings are used. Details of construction, performance, etc., will be published in an early issue of AVIATION.

Fokker to Open American Factory

Since the Witteman Aircraft Corp. went into bankruptcy, there has been much speculation regarding the future of the factory and flying field of this firm, which are situated at Hasbrouck Heights, N. J. The development of this field into a well equipped airport would be a great convenience for New Yorkers, as it is much nearer to the heart of the city than the various Long Island fields.

On Aug. 13, the trustees of the bankrupt were authorized to give Anthony G. H. Fokker, the Dutch aircraft constructor, an option to purchase the plant and equipment of the Witteman Company on or before Nov. 1, 1923. The building and flying field have passed out of the control of the trustees, but it is understood that Mr. Fokker will secure control of these at the same time he purchases the assets of the aircraft company. A substantial payment has been made for the option, and when Mr. Fokker can come to this country, as he hopes to do before long, it is probable that he will exercise his rights under the option. The option also includes the taking over of the contract which the trustees hold for reconditioning a number of DH4's into DH4B's for the Army Air Service, and which work is under way.

The probability of a European aircraft constructor opening a factory in the United States is an encouraging sign, particularly when the enterprise is under the direction of the shrewd Dutch manufacturer. While the plans are as yet in the formative stage, it can nevertheless be stated that the possibilities of air transport in the United States were really the principal attraction leading up to the decision of Mr. Fokker to take up the option.



Wide World Photos

Nieuport-Delage airplane on which Sadi Lecointe equalled Lieut. John A. Macready's altitude record. On the right, the engine installation, with the special thin-wall Lamblin radiators

St. Louis Field Under Severe Test

St. Louis Field, where the International Air Races will be held, Oct. 1, 2 and 3, received an unexpected test from the elements on Aug. 8, when a torrential rain storm swept over the field. Although the rainfall was the heaviest ever recorded for the same period by the St. Louis Weather Bureau, the 4300 ft. of sewer recently completed stood the test admirably and there was practically no damage to the 150,000 cu. yd. of new grading.

In an official report, Col. A. T. Perkins, chairman of the Grounds Committee, says:

"According to reports from the Weather Bureau, there was a rainfall of 3.46 in. in 1 hr., Wednesday night, Aug. 8, at about 8.40—the heaviest rainfall in the history of the St. Louis Weather Bureau, which began in 1871. This corresponds with a previous high record of 2.95 in. on July 14, 1912. The sewer carried off the water all right, and inspection this morning showed it to be unharmed.

"Rye and grass are already showing up on parts of the finished field, which we have recently seeded. Work on the hangars is in good shape, the fencing is well under way, telephone trunk lines are under construction and we are starting this week on the first of the pylons."

U. S. ARMY AND NAVY AIR FORCES

Riding the Waves in a Seaplane

According to the Luke Field *Fish Tail,* if you are looking for a thrill take the HS2L and land it out to sea. There are a few veterans who have tried their hand who are around yet, but even they seem to have lost their appetite for their seagoing planes. It has been noticed that the Navy pilots seldom try landing outside the harbor. Coming down isn't so bad, as the waves do not look so very high. The bottom about gives in the first wave you hit, you float down and immediately take off, repeating the operation about six times.

The fun commences on the take off. You push forward on the stick; it is not necessary for you to pull back on the stick, as the ship immediately points its nose to heaven, and when you are on the top of the bounce the nose drops and you are sure you are trying to imitate a submarine. You bring the nose up and the ship hits immediately, taking the air again. This operation is repeated, and if you are able to resist the temptation of closing the throttle and taxiing home you may take the air to stay, after the fifteenth bounce.

Model Airway is Busy

During the month of May, 1923, 224 airplanes have passed over the Model Airway which now extends from New York to Dayton, Ohio. This is quite a startling increase in air traffic over the twelve trips made during the month of June, 1922, which was the first full month of operation.

At London, Ohio, there is in process of erection a tower with a revolving searchlight, which will be used for night flying experiments between Columbus and Dayton.

Forest Patrol Cooperation

Officers of the Air Service while gladly cooperating with the Agricultural Department in the annual forest fire patrol are hopeful that next year funds will be provided by Congress in the appropriations for the Agricultural department instead of being taken from the allotments of the Air Service as has been the case. Although the cost of the aerial patrol work last year was not more than $60,000, this amount cuts the operations of the Air Service in military activities.

Lieut. Col. Jas. E. Fechet, Air Service has been designated by the War Department as the representative of the Department to confer with Roy Headley of the Department of Agriculture in working out a plan relative to aerial forest fire patrol. Army officers hope that the ultimate arrangement will be for the Agricultural Department to provide the funds and the Air Service to conduct the operations.

Army Orders

Maj. Gen. Mason M. Patrick, Chief of Air Service, granted sixteen days' leave of absence, effective on or about Aug. 20.

First Lieut. David L. Hardee, 28th Inf. from Plattsburg Barracks, N. Y. and Fort Ontario, N. Y. to Langley Field for duty as student officer in A.S. Tactical School.

First Lieut. Clarence H. Welch, A.S. from Langley Field to duty as student, Wharton School of Finance, University of Pennsylvania, Philadelphia.

First Lieut. Jasper K. McDuffie, A.S., from Chanute Field, Rantoul, Ill., to Mitchel Field, Long Island, N. Y.

First Lieut. Charles W. Steinmetz, A.S., from Fairfield Air Intermediate Depot, Fairfield, Ohio, to Bolling Field, D. C.

First Lieut. Phillips Melville, A.S., leave of absence extended one month and seven days.

First Lieut. David Sidney Seaton, A.S., promoted to Captain.

Sec. Lieut. Thomas R. Howard, 10th Infantry, from Fort Thomas, Kentucky, to Air Service Primary Flying School, Brooks Field, Texas.

Leave of absence of one month to Maj. Byron Q. Jones, A.S.

First Lieuts. George W. Polk, Wallace R. Fletcher, Alexander Pearson, jr., Charles L. Morse, A.S., McCook Field, Dayton, Ohio, to Engineering School, that station, for instruction.

Use of Smoke Candles

France Field, Panama Canal Zone, recently secured from the Chemical Warfare Service a shipment of 100 smoke candles of the Mark II S-I type, a candle of English manufacture. These were experimented with to determine their usefulness as wind tell-tales in coming into a strange field and also as part of cross-country equipment in Panama, where in the event of a forced landing in the jungles the crew of the lost plane could set up a smoke signal wherever they saw searching planes hovering about nearby, and thus disclose their position. A report of these experiments is given below, as follows:

Nomenclature: Candle, smoke, Mark II/L Type S-I.

Description: Cylindrical, 6 in. tall, 3½ in. diameter, weight 3½ lb. English manufacture.

To ignite: Pull away tape crossing the top, thus disclosing igniting stem and detached striking tab. Scratch stem with tab until candle ignites. (Full directions for use are on each candle.)

Time of burning: 4¼ min., 5 min. maximum.

Experiments conducted with this candle on land, from airplane on land and water, on the water, and in mud, indicate that it is not incendiary. The candle smokes with little heat. While the can container becomes quite hot, there is little heat felt in the smoke coming from the candle. It may be used in water, the substance once ignited coming to the surface and there forming the smoke. The water has a damping effect on the smoke, however.

It may be dropped on land or water from an airplane, but should not be dropped on land from a height greater than 150 ft., as there is danger of the cans splitting and there is less precision in throwing the can from heights greater than this. It burns with a yellow smoke, visible from two to ten miles away on land, and in the water one mile away. It must be ordinarily struck with the striking tab about three times before igniting.

The candle should be held firmly on the cowling by someone other than the pilot. Should be ignited too far back rather than too near the objective, as they may be held about one minute, but not longer, after igniting. There is the chance that it may not ignite immediately upon the first strike of the tab. Immediately upon igniting, the scratching tab should be thrown away, as this sometimes burns. The candle should be held for about ten or fifteen seconds and then dropped down in the slipstream of the lower wing. It will not roll a greater distance than 50 ft. after striking smooth ground.

The following suggestions are made for the use of these candles:

(1) As part of cross-country equipment. Two for each two-seater, and one for each single-seater machine.

(2) In case of forced landing may be used by the crew of the wrecked plane to indicate their position to searching planes whenever any are seen or heard overhead or nearby.

(3) In finding wind direction by flight leader upon coming into a strange field.

(4) In place of panels. The great distance their smoke column is visible from the air, and the fact that the smoke column may be controlled in puffs by the use of a canvas sheet, makes their use in place of panels practicable, but further experiments should be made in this direction.

(5) In single-seaters smoke candles should be carried only for use in case of forced landings.

Chinese Officers Visit Camp Nichols

The flying field at Camp Nichols, Rizal, P. I., was recently visited several times during one week by Brigadier General Chung and Colonel Ching of the Chinese Army. These officers are interested in aviation, and it is understood that they are making a trip around the world, visiting various countries with a view to inspecting air service activities, both commercial and military. During their visit to Camp Nichols they were taken on several flights, one of which was to Camp Stotsenburg and return. Both of these officers are very agreeable and pleasant in every way and have the personal element of aviation at heart as well as the technical.

Air Service in Hawaii "Prepared"

This is what an officer stationed in Hawaii, writing for the Luke Field *Fish Tail*, has to say on the state of preparedness of the Air Service in the mid-Pacific Islands.

Most officers, myself included, when ordered to foreign duty, shrugged their shoulders and decided that it would be three years out of their army career that would be wasted, and decided to make the best of it.

"Those who have been fortunate enough to be assigned to Luke Field have now decided otherwise. Nowhere in the Army does an Air Service officer get such a variety of training. Every time a plane leaves the airdrome it is on a tactical mission, simulating some maneuver for war training. The flying is always interesting. It never grows old, for one never does the same mission two days in succession.

Noncommissioned officers are trained as gunners, bombers and radio men.

"There is not a station in the Army that could be ready for war quicker. We are ready now. Perhaps that is why the Inspector General thought we were one of the best organizations in the Army."

102d Observation Squadron

The members of the 102d Observation Squadron, New York National Guard, started two week's training at Miller's Aviation Field, formerly the old Commodore Vanderbilt farm, at New Dorp, S. I. on Aug. 4. Maj. K. P. Littaeur a former member of the Lafayette Escadrille and a corps air service commander during the Argonne battle, is commanding officer of the 102d Observation Squadron.

The squadron constitutes the air service for the Twenty-seventh Division and is one of the new flying units maintained by the State. It comprises 138 enlisted men, ten crack fliers, all of whom are veterans of the World War and some of whom are distinguished aces, together with other officers specializing in wireless, airplane engineering, aerial photography and machine gunnery.

The daily program of the men has consisted of flying over the field with the regular army planes in the forenoon, with lectures in the afternoon on technical subjects with practical work on airplane engines and machine guns.

U. S. NAVAL AVIATION

Inflation of the ZR1 Started

The inflation with helium of the Navy's rigid airship ZR1 at Lakehurst, N. J., started on Aug. 13. It is expected that the inflation will take about four days. The ship will be filled to 85 per cent of its capacity, which is the amount to be used for service flights. This will permit the airship to ascend to 6000 ft. without the gas pressure forcing any of the gas out of the bag.

Upon the completion of the inflation the ship will be "launched" from its cradle and will be moved to the other side of the hangar. The method of doing this will be to put an excess amount of water in the ballast bags forward and aft and by letting the water out gradually permit the big bag to float clear of its cradle. The ship will be floated with its fuel tanks full and lifting a total of 31,000 lb. useful load. The first flight out of the hangar will be made about Sept. 1.

Loss of a Reptile Mascot

The Marine aviators at Port au Prince, Haiti, regret the loss of their mascot, the "Famous Limping Lizard". This reptile, the pride of the station, saw considerable service, and may safely claim to have been the only flying reptile since the days of Icthyosaurus, of pre-caveman fame. The manner of the demise of the mascot was not stated.

New Way of Fueling Planes

The Marine Scouting Squadron One, stationed at Guam, Pacific Ocean, has developed a new system of gassing seaplanes at anchor away from the beach. A one-cylinder motor, resurrected from a discarded Smith motor wheel, and an air compressor furnish the motive power. Compressed air admitted through one opening of the gasoline drum forces the fuel through a hose to the plane's gasoline tanks. Planes in the harbor are now, by the use of this device, refueled at the rate of seven minutes per drum of gasoline, a big improvement over the old rate of thirty minutes, by hand. Gunnery Sergeant J. B. Davis, U.S.M.C., is the originator of the idea. The mechanical details were perfected by the machine shop force.

Aviators on Exploring Trip

The Naval Air Station at Pearl Harbor, Hawaii, has added scientific exploration to its list of activities. Johnson's Island, a tiny dot in the Pacific 700 miles west southwest of Hawaii was visited by an aerial exploring party headed by Comdr. John Rodgers, U.S.N., Commanding Officer of the station. The men and planes were transported in a mine sweeper.

A scientific expedition of the Department of Agriculture under Dr. Wetmore, the "wild bird man", accompanied the aviators on the mine sweeper Whipporwill and were landed on the island for a stay of ten days, when another Navy craft will pick them up and convey them to Wake Island for further scientific work.

Commander Rodgers returned to Pearl Harbor, leaving Ensign Kindell with the aviation detachment to chart the island and keep the scientists company. Besides an aerial survey, an aerial photographic mosaic map will be made. The means for providing for accuracy in the map are very interesting. Before the pictures are taken, a "base line" 1000 yd. long will be laid on the island, the ends of which are to be marked by white crosses made of sheeting 6 yd. wide and 75 ft. long. These will show in the picture and thus form a basis for measuring distance and direction in the pictures. This map will be of much value from both a navigational and strategic point of view.

Johnson's Island is of sand formation, about one half mile long and one fourth mile wide. The island belongs to the United States and is used as a reservation for sea birds, which inhabit the islands by thousands. One species, the shoarwater, burrows under ground to make its nest, and these birds have honeycombed the island with their storm collar homes—a kind of seagoing and airgoing prairie dog.

COMING AERONAUTICAL EVENTS

DOMESTIC

Oct. 1-3 — National Airplane Races, St. Louis, Mo.
Late Fall — Curtiss Marine Flying Trophy Race

FOREIGN

Sept. 23 — Gordon Bennett Balloon Race, Brussels, Belgium
Sept. 28 — Schneider Maritime Aviation Trophy Race, Cowes, Isle of Wight, England
Dec. 1 — Entries close for French Engine competition

Boston Naval Aviation Unit

The Naval Aviation Reserve Flying Unit at Boston will probably start flying this week. Lieut. G. R. Pond, U.S.N.R.F., has organized the Unit and flew a WA seaplane there last week. Two N9 seaplanes arrived the latter part of last week and have been assembled for flight. The station is located at Squantum, Mass., near Boston.

ZR3 Progressing Satisfactorily

The work on the ZR3, the big Zeppelin airship being built by Germany for the United States is progressing satisfactorily and it is expected that the airship will be flown to this country sometime in November. It will have its home in this country at the Naval Air Station at Lakehurst, N. J., where it will share the huge hangar there with the ZR1, the U. S. Navy built rigid airship.

Schneider Entries Leave for England

The four Navy pilots with the four fast Navy seaplanes that will represent the United States in the Schneider Cup Seaplane Race in England left on the S. S. Leviathan for Southampton Aug. 18. Lieuts. F. W. Wead, in charge and alternate pilot, A. W. Gorton, D. Rittenhouse and R. Irvine comprise the team that is leaving from New York. They are taking with them the two Navy Curtiss seaplanes CR3, the Navy Wright seaplane NW2 and the TR3. (Alternate plane.)

The performance of these planes in their official trials has been highly satisfactory. Both the CR3 and the NW2 have made more than 175 mi./hr. This speed exceeds the former world's record for seaplanes held by England at 146 mi./hr. by about thirty miles. The TR3 is of the same type as the plane that won the Curtiss Marine Trophy Race in Detroit last October.

The Schneider Cup Seaplane Race is to be held at Cowes, England, near the Isle of Wight on September 28. This is the third time since the war that this race has been held, but it is the first time that the United States has been represented. There will be entries from England, France and Italy to compete with the U. S. Navy pilots.

St. Louis Keenly Interested in Air Races

Lieut. Comdr. Marc. A. Mitscher upon his return from a short trip to St. Louis in connection with the International Air Races to be held there next October, reported that the interest there in the races is very keen. Progress in the construction of the landing field to be used is progressing very satisfactorily and the field will be ready in ample time for the races. The Navy team under the command of Lieut. Comdr. Mitscher will leave for St. Louis about Sept. 10.

Preparations for G. B. Balloon Race

Preparations for the participation of the U. S. Navy in the Gordon Bennett International Balloon Race to be held in Brussels next fall are well under way. The aerological equipment to be used by the Navy entry is being assembled for shipment to Brussels. The Navy team will sail for Europe on the S. S. George Washington about Sept. 1. Lieut. J. B. Lawrence is the pilot, with Lieut. F. W. Reichelderfer as aerological aide. Two enlisted men to act as the handling crew for the Navy balloon complete the detachment.

Orders to Officers

Mach. Stephen D. Thornton, detached Naval Air Station Hampton Roads to U.S.S. Wright.

Ch. Mach. Rufus H. Bush, detached Bureau of Aeronautics to Naval Air Station, Hampton Roads.

Lieut. Carleton McGauley, detached Aircraft Squadrons Scouting Fleet to Naval Air Station, Pensacola.

Lieut. Russell V. Pollard, detached Naval Air Station Pensacola to Aircraft Squadrons Scouting Fleet.

Lieut. Hugh S. Sease, detached Naval Air Station Pensacola, to Aircraft Squadrons Scouting Fleet.

Lieut. Robert L. Fuller, orders 7-11-23 revoked continue duty Aircraft Squadrons Battle Fleet.

Lieut. (j.g.) Charles A. Collins, detached Receiving Ship Philadelphia to Naval Air Station, Anacostin.

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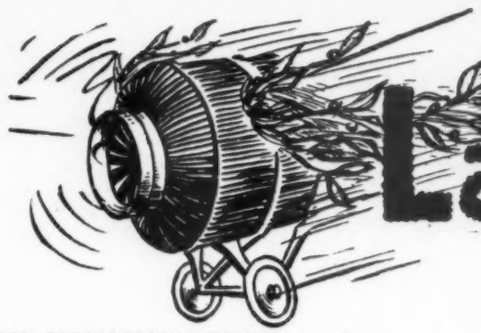

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Flying, (English), 1919, 18 issues.
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Flying, 1915, 12 issues; 1916, 12 issues; 1917, 2 issues; 1919, 9 issues; 1920, 9 issues,
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